# EFFICACY OF MITOMYCIN C IN EXTERNAL DACRYOCYSTORHINOSTOMY

# A RANDOMISED CONTROL TRIAL

DISSERTATION SUBMITTED TOWARDS FULFILLMENT OF THE RULES AND REGULATIONS FOR THE M.S. BRANCH III OPHTHALMOLOGY EXAMINATION OF THE TAMILNADU

DR. M.G.R. MEDICAL UNIVERSITY

TO BE HELD IN APRIL, 2014

# EFFICACY OF MITOMYCIN C IN EXTERNAL DACRYOCYSTORHINOSTOMY

# A RANDOMISED CONTROL TRIAL

SUBMITTED BY
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# BONAFIDE CERTIFICATE

This is to certify that this dissertation entitled **"Efficacy of Mitomycin C in External Dacryocystorhinostomy-A Randomized control trial"** done towards fulfillment of the requirements of the Tamil Nadu Dr MGR Medical University**,** Chennai for MS Branch III Ophthalmology examination to be conducted in April 2014 ,is the bonafide original work of Dr. Vinod Joshua John, Post Graduate student in Ophthalmology, Christian Medical College, Vellore.

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1 INTRODUCTION Epiphora due to primary nasolacrimal duct obstruction is an often encountered disorder in our community.The gold standard of treatment for Primary Acquired Nasolacrimal Duct Obstruction (PANDO) still remains the external approach of Dacryocystorhinostomy(EXT- DCR) technique since its evolution in the early 20th century. The success rates achieved by Depuy-Dutemps and Bourguet (1) with this current technique reached 94% in the 1920s.Attempts were on to improve on this success rate with modifications but surprisingly it has stood the test of time with hardly much changes. But with the advent of better needles, fine suture materials , endoscopes, lasers, powered drills and modern...

## Efficacy of Mitomycin C in External Dacryocystorhinostomy-A randomised control trial

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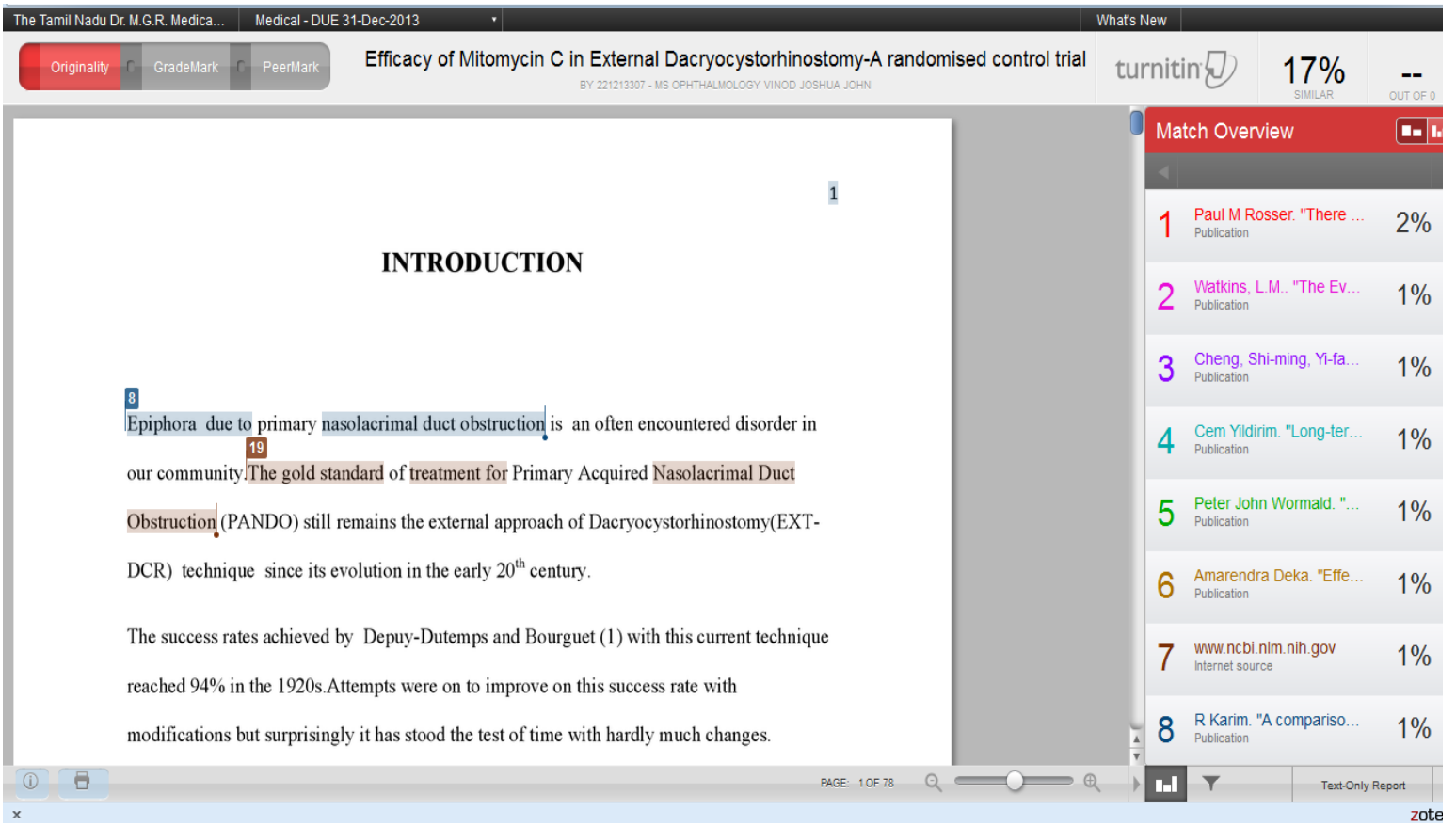

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# INTRODUCTION

Epiphora due to primary nasolacrimal duct obstruction is an often encountered disorder in our community.The gold standard of treatment for Primary Acquired Nasolacrimal Duct Obstruction (PANDO) still remains the external approach of Dacryocystorhinostomy (EXT-DCR) technique ever since its evolution in the early 20$^{th}$ century.

The success rates achieved by Depuy-Dutemps and Bourguet (1) with this current technique reached 94% in the 1920s.Attempts were on to improve on this success rate with modifications but surprisingly it has stood the test of time with hardly much changes.

But with the advent of better needles, fine suture materials , endoscopes, lasers, powered drills and modern anaesthetic techniques, the attempts were on again in the 1980s to further improve the success rates of DCR.More importantly, better endoscopic techniques has brought to focus the major causes for failure of external surgery,namely scarring within the anastomosis and at the common canaliculus, closure of the ostium by granulation tissue,ahesions to the medial wall of nose,and new bone formation.

Naturally, wound healing modulation with antifibrotic agents like Mitomycin C and 5 Fluorouracil were the next logical adjuvants to DCR aimed at preventing proliferation of fibroblasts and thereby scar formation which could further potentially refine the success of DCR.

Mitomycin C (MMC), is an alkylating agent which is used as an anti cancer drug and its is an antibiotic derived from Streptomyces caespitosus .It has a property to reduce collagen synthesis of fibroblasts by inhibiting DNA dependent RNA synthesis.It was being effectively used to improve outcomes of Trabeculectomy surgeries since the 1980s.Various studies which followed, used Mitomycin C in various concentrations and exposure durations as an adjuvant in both External and Endonasal DCR.

As of now, only limited number of trials has used intraoperative Mitomycin C in Ext-DCR and of them very few are randomized controlled trials. Few studies suggested that there is a significant difference in the success rates with MMC but the majority of the other studies could not prove statistically significant increase in success of outcomes .Thus the results are equivocal. Of all the previous published studies, only 3 studies are done on Indian population. Also there is no standardisation of the use of MMC among researchers as to the concentration, technique and duration of exposure.

From the published data on the use of MMC, it seems that there could be a favourable and positive short-term effect of MMC, but there is not enough evidence regarding its long-term effect of prevention of scarring at the rhinostomy site leading to failure of Ext DCR.But MMC cannot be used indiscriminately for all primary DCRs as it has very serious side effects and the risks-benefits has to be weighed carefully before inducting it in regular standard practice. Therefore, there is a definite need for more randomised control trials to come out with definitive results regarding its efficacy, duration and technique of application and adverse effects.

The proposed study would thus contribute to the literature on use of MMC in cases of Ext-DCR and the data thus obtained would help formulate protocols in the practice of the same in terms of the indication, duration and technique of application of MMC.

# AIMS AND OBJECTIVES

The aim of this study is to compare the success rates of External Dacryocystorhinostomy (Ext-DCR) with and without the intraoperative application of Mitomycin C (MMC) at the ostium site.

# LITERATURE REVIEW

Epiphora or overflow of tears is a common complaint that is encountered in our day to day practise. It can be caused by anterior segment causes like a decrease in tear drainage or an increase in lacrimation,lid malpositions, eyelid margin disorders, tear instability or deficiency, trichiasis, superficial foreign bodies and cranial nerve V irritation.All these conditions cause an abnormal increase in tear production. When these conditions are ruled out, tear drainage abnormality is the likely diagnosis.

Abnormalities of tear drainage may be divided again into Functional and Anatomical. Functional failure can be caused by poor lacrimal pump function, which inturn may be caused by eyelid laxity, weak orbicularis, displaced punctum, or cranial nerve VII palsy. Anatomical obstruction can occur at any point along the lacrimal clearance pathway and can be Congenital or Acquired.

**Primary Acquired Nasolacrimal Duct Obstruction (PANDO)**

The 2 categories of Acquired nasolacrimal drainage obstructions are Primary and Secondary. It was Linberg and McCormick introduced the term Primary Acquired Nasolacrimal Duct Obstruction (PANDO) in 1986.They described this entity as nasolacrimal duct obstruction caused by inflammation or fibrosis without any precipitating cause (2). These studies have revealed oedema, vascular congestion, and inflammation of the nasolacrimal duct in the early phases.These changes ultimately resulted in fibrosis with complete occlusion of the nasolacrimal duct's lumen in the late phases.Later,Bartley proposed

an etiologic classification system for secondary acquired lacrimal drainage obstruction (SALDO) (3)(4).

**Epidemiology**

Ancient Egyptians described symptoms attributable to lacrimal outflow obstruction in their papyrus writings according to the famous ophthalmic historian Julius Hirschberg. The Talmud of the Jews mentions lacrimal sac abnormalities. The term '*epiphora*' can be traced back to ancient Greece and is based on the Greek word '*epifora'*. The works of Hippocrates also mentions the relationship between aging and epiphora (5).

Despite the long historical recognition of the symptoms of lacrimal flow block as described above, there is only very little data available regarding the epidemiology of acquired lacrimal drainage obstruction.

Few have reported the incidence of this problem although symptomatic acquired nasolacrimal duct obstruction is so commonly encountered in clinical practice. Dalgleish reported a series of 3487 patients undergoing lacrimal irrigation before all intraocular procedures at one eye hospital in Manchestor,Great Briton.(6).He mentions the incidence of lacrimal obstruction to be 11%, increasing with patient age to over 30%.

An incidence of 20.24 per 100,000 has been reported in a study done in Olmsted County, Minnesota,USA (7).

The incidence of PANDO in the Indian subcontinent has not been quantified yet though it is a fairly common occurrence.

**Gender variations**

Traquair(8) stated that the males to females ratio attending ophthalmic outpatient clinics with dacrocystitis is about 1:5. Duke Elder claims that this ratio can be extrapolated and that it applies to the incidence of dacryocystitis in the whole population (9) . Stallard (1958) mentions that lacrimal duct obstruction is four times more commonly seen in females compared to males. It has been hypothesised that the smaller diameter of the lacrimal canal and the inferior bony lacrimal fossa in females may contribute to the increased occurence of nasolacrimal duct obstruction in females.(9) The loss of mucosal vascular plexuses in postmenopausal women is also thought to be a contributing factor.

Groessl et al (10) did research of this by serial axial CT scans on the bony lacrimal passage.They found that the in females, the bony nasolacrimal canal was narrower and flatter against the nasal floor compared to males. They also found that with increasing age up to 40 years, the diameter and the sectional angle between the bony canal and the nasal floor also proportionately increased.

Janssen et al (11) also did axial CT scans of the drainage passage measuring the minimum diameter of the nasolacrimal duct.He found that compared to men,women had statistically smaller measurements.

However, it is observed that gender difference is not associated with difference in success rates of DCRs.

**Age**

It is observed that the incidence of PANDO increases with age. It is more common in adults over middle life from 5th to 7th decade(12)(13).

**Racial Variations**

The nasolacrimal passage of Blacks and Asians is said to be wider and shorter compared to the Whites.This observation would lend credence to the finding that nasolacrimal obstruction occurs more often in Whites than other races (4). But more controlled comparison studies are needed to further augment this finding.

## External Dacryocystorhinostomy (EX-DCR)

The Gold standard for treatment for Primary Acquired Nasolacrimal Duct Obstruction is still External DCR.

A normally functioning lacrimal pump, properly positioned and patent puncta as well as a present and patent canaliculi are required for the operation to be successful. The preoperative assessment is aimed at confirming the presence of the above factors as well as at ruling out other potential causes of chronic epiphora.

The aim of the surgery is to:-

Form a low-resistance tear drainage bypass between the conjunctival cul de sac and the nasal cavity, by converting the lacrimal sac into part of the lateral nasal wall.

Principles of Surgery are:-

1.Creation of an ostium in the lateral wall of nose adjacent to the sac.

2.Fashioning of the lacrimal sac flap and nasal mucosal flap

3.End to end anastomosis of flaps

**History of DCR**

Surgical treatment of dacryocystitis stretches back nearly 2000 years. The first mention of lacrimal surgery appears to have happened in about 1750 BC.It is mentioned in the oldest recorded set of laws, the King of Babylon's Code of Hammurabi.(14) Celsus, in the first century, described a method of creating an artificial passageway into the nose by using hot cautery to puncture through the lacrimal bone(15). Several methods had been tried by surgeons in the early part of the 20th century. An interesting approach involved attempts to drain the lacrimal sac into the maxillary sinus. Intranasal approach operations had also been described(1).

In England, Woolhouse described the earliest operation that would resemble a modern external DCR in the 18th century. He advocated extirpating the sac, perforating the lacrimal bone and placing a drain made of silver, lead or gold (15).

Caldwell in 1893 and Toti in 1904 published what is considered the first modern description of external DCR(15). An external incision was made; the periosteum and the sac were elevated. A bony ostium was created using a punch. The medial sac wall was excised with the help of a canalicular probe as a guide. A corresponding piece of nasal mucosa was removed. The technique of suturing instead of excising of the lacrimal sac and nasal mucosal flaps was described as early as 1914.

Ohm in Germany and Depuy-Dutemps and Bourguet in France independently published what became the basis of truly modern DCR in the 1920's(1). These surgeons popularised suturing of both the posterior and anterior flaps.

Depuy-Dutemps and Bourguet reported success rates of around 94%. Dupuy-Dutemps published the first major series of more than 1000 cases reporting a success rate greater than 90% and set a standard that has been upheld in almost all study series emerging since then. Over the past decades, this procedure has undergone surprisingly few modifications. The arrival of better needles, fine suture materials, drills and modern anaesthetic techniques has however bettered the success outcomes of DCR.

Several modifications were developed throughout the 20th century in view of the fears of significant bleeding when the angular vessels were encountered and difficulties in suturing both posterior and anterior flaps (16). Issues such as incision placement, elevation of medial canthal tendon, , placement of stenting material, flap sutures, use of chisels, rongeurs, bone trephines, burrs or cautery of posterior flaps and whether to suture the posterior flaps were explored and debated (17).

## Endoscopic DCR

In 1893 Caldwell first introduced the endonasal approach for lacrimal sac surgery. West in 1914 modified the technique(18). He introduced the concept of a window osteotomy to access the nasolacrimal sac and duct by removal of the lacrimal bone and the superior maxilla. Mainly due to the difficulties in visualising the intranasal anatomy these approaches did not gain present popularity.

In 1989 the first clinical study of endoscopic DCR came to be published by McDonough and Meiring(19). With the introduction of better operating microscopes, fiberoptic delivery systems ,semirigid and rigid nasal endoscopes, the intranasal anatomy could be better visualised by the surgeons.

With the advent of Functional Endoscopic Sinus Surgery,semi-rigid and rigid endoscopes were used with increased frequency, particularly by otolaryngologists. In the era before the advent of these advances, the popularity of the endonasal technique was limited by the bleeding from the nasal mucosa and poor visualization due to low illumination in the superior nasal cavity. As of now, the procedure is gaining popularity compared to conventional external dacryocystorhinostomy.

External and endoscopic dacryocystorhinostomy have the same goal ie to bypass of the blocked nasolacrimal duct by creating a passage above it so that the internal common canaliculus communicates directly with the nasal cavity through the lateral wall of nose.

The technique of surgery includes removal of the nasal mucosa overlying the lacrimal fossa.Additionally, the sac can be demonstrated by inserting a light pipe through the canaliculus. A rhinostomy is made using a rongeur or cutting burr to expose the medial and anterior walls of the sac.Then, the medial sac wall is excised. There is no formal anastomosis of nasal mucosal flap and lacrimal sac flap. Postoperatively.irrigation and removal of crusts and clots from the nose is done at frequent intervals.

# Adjuvants to Endonasal DCR

## Laser assisted Endo-DCR

In 1982 came an important observation by Linberg (20) that the final healed ostium shrinked to only 2% the size of the initial peroperative ostium and that it was enough to provide good functional results.Taking note of this, more and more surgeons increasingly used endoscopic approach in lacrimal surgery and explored the use of lasers in DCR.

Gonnering et al (21) came forward with the first clinical study of endonasal laser-assisted DCR, which used the carbon dioxide (CO2) and potassium titanyl phosphate (KTP)/neodynium-yttrium-garnet (YAG) laser for osteotomy.

Woog et al (22) studied the use of the holmium:YAG laser for bone removal. He said that the holmium:YAG satisfactorily fulfilled the characteristics of an ideal laser for endolaser DCR namely the ability to be delivered through a flexible fiberoptic delivery system, excellent haemostasis ,efficient bone ablation and minimal collateral damage. The overall long-term ostium patency rate in their series was 82%.

The laser of different wavelengths used to perform osteotomy as part of the DCR ,mostly transnasal approach are Holmium:Yttrium-Aluminum-Garnet (Ho:YAG) laser, potassium-titanyl-phosphate (KTP) laser, Erbium:YAG (Er:YAG) laser, Neodymium:YAG (Nd:YAG) laser and diode laser (23).

With success rates of the laser assisted technique ranging from 64% to 85% ,this technique seems to be less effective than cold steel endoscopic DCR (24). The reasons for these inferior results could be due to the small size of the osteotomy. Most lasers can only create a 5–8 mm osteotomy because they only remove the thin lacrimal bone at the postero inferior aspect of the lacrimal sac .The DCRs with small ostia created by laser were found to have patency rates of only 70%. . But if an attempt is made to remove the rest of the thick bone with a laser, then the excessive heat generated may increase tissue damage and postoperative fibrosis, scarring and stenosis.

Umapathi et al (25) reported long term results for Laser assisted DCRs .He had a 5 year follow up data showing poor long term results declining to even 56%.

**Radiofrequency assisted Endo DCR**

Javate et al (26) introduced a radiofrequency unit for incision of the nasal mucosa and bone during Endo-DCR which simultaneously coagulates and cuts with minimal thermal collateral damage. The study attained a 90% success rate at 3 months follow up.

**Powered Cold Steel Endo DCR**

The challenge in Endo-DCR is the full exposure of the sac.The hard bone of the frontal process covers the upper half of the sac. Maximum exposure of the sac requires maximal removal of an extensive area of the thick bone above the axilla of the middle turbinate and the lateral wall of the agger nasi cell.

This cannot be achieved without using a chisel or powered drill. The results of Endo DCR can be bettered by a full lacrimal sac exposure and larger rhinostomy as it is thought that the larger size of the ostium, better the outcome of DCR surgery. This could be best achieved with a diamond burr drill as it allows easy and rapid bone removal while protecting the sac mucosa from damage.

An angled (15°) coarse diamond burr attached to a microdebrider is used to for this purpose.. At the end of the surgery, the U-shaped flap fashioned facilitates primary intention healing along the posterior, inferior and superior edges of the junction between the sac and nasal wall. The anterior edge of the rhinostomy remains uncovered by mucosa which gets healed by secondary intention.

Wormald et al (27) in his series published a high success rate of 95% at 11 months post operative assessment with this method which was comparable to that of External DCR.

**Trans Canalicular DCR**

A 600-micron fibreoptic with a blunt hemispherical tip of neodymium:YAG (Nd:YAG) laser is inserted via the punctum. With intranasal endoscopic control, a rhinostomy is created with the laser. Ducts are intubated with Silicon tubes left in place for 6 months.

Pearlman et al (28) did 49 such procedures with a success rate of 85% . This surgical technique affords a simple, incisionless, bloodless alternative to conventional DCR.

Eloy et al (29) in 2000, first reported the use of a diode laser for canalicular DCR with success rate of 58%. Fernandez et al (30) in 2004 reported a success rate of 90 %.But generally success rates are lower probably because of the small initial ostium created as compared with External DCR. One study by Pal et al (23) showed a final ostium size of average 5mm at 6 month follow up giving him a success rate of 69%.

**Advantages of External DCR over Endonasal DCR**

- Good exposure of the whole Sac
- Primary intention healing of mucosal flaps promoted by sutured apposition
- Preparation of a large ostium
- Allows ready access for the surgical management of canalicular disease; this includes canaliculo-DCR, open placement of a canalicular bypass tube or retrograde canaliculostomy and intubation.
- Provides direct visualization of abnormalities of the lacrimal sac – including stones, tumors or foreign bodies
- Cost effective
- Shorter operating time

**Advantages of Endonasal DCR over External DCR**

- Avoidance of a facial scar;Better cosmesis
- Preservation of the lacrimal pump mechanism.The absence of an external incision decreses the risk of damage to the orbicularis oculi muscle, medial canthal ligament and pretarsal fibres which are essential for an intact lacrimal pump.
- Earlier postoperative recovery time
- Simultaneous correction of the intranasal causes contributing to the NLD obstruction
- Lower rates of regurgitation of air while blowing nose (31)
- Lower risk of CSF rhinorrhea
- In good hands success rates match that of external DCR.

**Success rates of External DCR**

Leong et al (32) did a systematic review of the literature from January 1966 to December 2008 for the clinical outcomes of DCRs. A total of 73 studies that fulfilled the inclusion criteria were analyzed. A total of 4800 patients were pooled, from which 4921 DCRs were performed. Success varied between 65 and 100% after External DCR compared with Endonasal DCR, which varied from 84 to 94%. The success rate of Laser assisted Endonasal DCR varied widely between 47 and 100%. The wide range of success rates may be related to patient demographics, surgical variability, and dearth of standardised outcome measures.

Also the success rates are found to drop with passing time .In a study done by Mansour et al (33) in Netherlands on 139 External DCRs, the success rate was 89% after 1 year, reducing to 79% after 2–3 years and further to 71% after 4–5 years.

Even with the advent of above mentioned minimally invasive DCR techniques and their advantages,the external approach still remains the gold standard against which other methods are compared.

**Functional Vs Anatomical success rate- "The Lacrimal paradox"**

Patient satisfaction, quantified by the subjective and functional success is of prime importance as DCR is mostly performed to improve the quality of life of the patient. The patency of lacrimal passage is secondary.

The functional success rate is found to be less than the anatomical success rates in many studies.Fayers et al (34) studied outcomes for 124 external DCRs which showed an overall anatomical success of 74% but a functional success of only 69% .

Geoff Rose (35) tries to describe this as the "lacrimal paradox".This means that anatomical patency rates may not correlate with subjective success and vice versa. He explains that the symptoms of drainage disorders are either Volume related or Flow related. In most cases Volume related backwash from the lacrimal sac can be treated with lacrimal surgery.But the Flow-related epiphoras are largely due to limitations in tear conductance from the lateral canthus to the nasal cavity. Patient satisfaction of flow-related symptoms may not achievable in every case, and especially when there is hydraulic resistance in both the canaliculi and the duct.

**Analysis of Causes of Failure in DCR**

Factors noted to be the reasons for failure are

- Fibrous tissue growth
- Inappropriate size / location of bony ostium
- Sump syndrome
- Collapse of the bridge between anterior flaps
- Adhesion of the anterior to the posterior flaps
- Obstruction of the bony window with new bone formation
- Untreated common canalicular obstruction
- Intranasal adhesions
- Septate sacs incompletely connected to the nose

**Role of Ostium size**

The general teaching is that a large bony resection of 15–20 mm in external DCR is required to ensure a large anastomosis and thus a high success rate. With the use of intranasal endoscopes it has been possible to assess the characteristics of the healed intranasal ostium in external DCR.

Lindberg et al (20) did a landmark study of a series of 22 external DCRs. There was no correlation of statistical significance between the size of the intra operative ostium size and the final intranasal ostium.

He found that the average diameter of the healed ostium was 1.8 mm, inspite of an initial diameter averaging 11.8 mm intraoperatively.Other authors have consistently used his findings to support the argument that large osteotomies does not play a role in the final success.But on the contrary, this result could also suggest that if the large rhinostomies made in external DCR shrink to such an extent on healing, then it could be likely that smaller osteotomies produced endonasally could narrow to an extent where there could be a failure in adequate tear drainage.

Another argument is that in a well done external DCR, the lacrimal sac eventually becomes incorporated into the lateral wall of the nose and it could well be doubted if the endonasal measurements show the opening of the common canaliculus rather than the ostium.

The most important observation was that excellent functional success resulted even when the final ostium was quite small (20).

Performing a large osteotomy is one of the recommendations to increase the success rate of DCR. However, there is no agreement on the dimensions of the rhinostomy to be created.

Welham and Wulc (36) observed that 111 out of 208 cases of external DCR, a revision surgery was necessary due to inappropriate location or size of the bony opening. Thus the size of the bony ostium is considered as an important factor for a successful surgery (37).

Iliff made only a 10 mm diameter bony ostium, and he reported a success rate of more than 90%. In his failure cases, reunion of the bony opening was noted (13).

Even when the two main factors for success namely bony ostium of an appropriate location and size,combined with a technically perfect anastomosis, are expected to give a 100% long term success, it is not the reality.This could be due to the probability that the osteotomy created is not standard-sized, and when it is found that the bony ostium size is adequate to do the anastomosis, additional bone is not removed. Thus the bony ostium may not be of a size critical for adequate drainage.

Argin et al (38) even proposed to have a critical ostium size of 20 x 20 mm with his patients having 100% anatomical patency at a mean follow up of 31 months. The upper margin of the ostium extended to around 5mm superior to the internal opening of the common canalicus, and the lower margin included the bony nasolacrimal, measuring 2 cm in the vertical axis. In horizontal axis, the posterior bony margin was a precisely preserved posterior lacrimal crest, and an anterior ethmoidectomy was performed giving a 2 cm defect.No cases of CSF rhinorrhoea were reported by them.

With the larger osteotomy sizes, the question of the safety of the procedure arises as to the chances of cerebrospinal fluid leakage. Botek (39) in his cadaver study, found that the margin of safety between internal common canaliculus opening and the anterior part of the cribriform plate was approximately 25 mm.

**Location of Ostium**

A low location of ostium may not bypass an upper or mid sac obstruction; likewise an ostium located in a high position leaves the remnant nasolacrimal duct acting as a blind pouch vulnerable to reinfection and Sump syndrome.

**New bone formation**

As a general principle new bone formation requires the presence of periosteum and, in patients undergoing dacryocystorhinostomy, the periosteum is stripped away, thereby possibly minimising the chances of new bone formation. Primary epithelial closure almost certainly inhibits the new bone formation otherwise likely to occur with secondary intention healing(40).

Some authors have reported that bone regrowth is occasionally causative for failure of primary surgery (41).

Others maintain that bony regrowth do not occur and that fibrous scar tissue is primarily causative for obstructions at the anastomosis site (42).

**Role of Scarring**

Tissues must be repaired whenever possible by primary rather than secondary intention which is a basic surgical principle. An unopposed mucosal flap can result in secondary haemorrhage, infection and excessive granulation and scarring. This might result in the inadequate passage of tears through a scar rather than through an ideal mucosa lined orifice.

Ever since the first descriptions of DCR operations, authors reporting many large series have brought modifications to the technique and have reviewed the causes of failure in those whom DCR resulted in no relief of epiphora. On revision surgery of these cases, scarring within the anastomosis site was commonly noted in all these series(41)(43)(44).

In the series of Welham et al (36) with 128 patients, the scarring noted was divided into two locations.First, a localised common canalicular scar, probably due to persistent sac disease following the first surgery was found in 111 cases. Second, a dense scarring within the anastomosis was found in 17 cases.

**Advantages of Single anterior flaps Vs Double flap technique**

Jones (45) and Welham(46) pointed out that even though the suturing of the anterior and posterior flaps increases the chances of primary intention healing of the mucosal anastomosis,the single flap technique is simpler to perform in lacrimal surgery. Double flap suturing also helps with the control of intra-operative primary and secondary bleeding and fibrosis later on. Posterior flaps are technically difficult to anastomose. In the posterior part of the rhinostomy site, because of the close proximity of the sac and nasal mucosal flaps, it is likely that they would scar together.

Welham says that accurate anastomosis of mucosal flaps can incresase the success rates for external DCR to well above 90% (46).

In a study by Yazici et al (47), they compared 2 groups randomized by anastomosis techniques of single anterior and double flaps.The single flap group showed larger mean ostium height than in those with double flap anastomosis.But this difference was not statistically significant.The results of this study correlates with the observation that the intranasal ostium heals to a much smaller size, irrespective of whether only one anterior flap or both the anterior and posterior flaps were fashioned (21).

The anterior flap technique without posterior flaps has many advantages as well. There is less obstruction of the secretions by posterior flaps .Supposedly there are fewer internal openings in the drainage cavity, thus less chance of obstruction due to scarring around the common internal punctum. With posterior flaps there is an increased chance of sump syndrome where as there are lesser chances of infection with only anterior flaps. Finally, with anterior flap alone, the lacrimal sac remnant integrates well into the lateral nasal wall thus permitting tears to drain directly into the nose (48).

Becker (49) did a series of external DCRs without any flaps and surprisingly reported a success rate of 90%. He made large osteotomies with precise excision of adjacent mucosa and thereby having no redundant mucosal tissue in the osteotomy site leaving only a small gap for the remaining edges of the nasal mucosa and sac to scar to each other across the rhinostomy.

**DCR with Intubation using Stents**

Use of stents in lacrimal surgery was welcomed as a major advance in this field.But the debate is still going on regarding the role of silicone intubation in the surgical management of acquired nasolacrimal duct obstruction not associated with canalicular pathology .Some lacrimal surgeons use intubation routinely, wary of the 'just in case' postoperative scarring at the internal punctum of the common canaliculus,But we know that success rates in these cases already do approach 100% without the use of silicon stenting.

A randomized clinical trial in 100 patients by Choung et al (50) on the efficacy of external DCR with and without silicon intubation in uncomplicated primary nasolacrimal duct obstruction showed that the six-month subjective and anatomic success rate was 90% in intubation group and 87% in the non intubation group. But the better result in stent patients was not statistically significant.

In a prospective randomised study of primary Endonasal DCRs with and without silicon tube intubation by Smirnov et al (51) ,the results showed success rate at 6 months with silicone tube as 78%, and without silicone tube as 100% the difference being statistically significant. They advised not to use stent for primary surgeries.

Thus according to current evidence, silicone intubation is not associated with better functional and anatomical success rates in DCRs for patients with uncomplicated primary nasolacrimal duct obstruction without common canalicular disease (52).

Allen et al (53) observed that silicone stenting of the nasolacrimal duct was associated with an increase in the failure rate of primary DCR which showed statistical significance. They postulated that silicone tube by inciting granuloma formation in the drainage cavity, predisposed to DCR failure.

Thus, routine use of silicone intubation in DCR should be avoided except for cases like canalicular stenosis, small contracted or scarred lacrimal sac,a large valve of Rosenmueller occluding the common canaliculus or for revision DCR.

Its complications and side effects include corneal irritation, lacrimal sac mucosal granuloma formation, slitting of the punctae and canaliculi,tube displacement and difficulty in tube removal.

Based on a meta-analysis (54) that included 5 randomized controlled trials and 4 cohort studies analysing 514 cases of external DCR , endonasal laser-assisted , and nonlaser endoscopic endonasal DCR techniques with and without silicon intubation,.no benefit was found for silicone tube intubation in primary DCR.

**Wound Modulation in DCR**

Two common causes of failure in DCR are closure of the osteotomy site and common canaliculus by fibrous scar tissue (44) .Thus it has been suggested that modulation of the wound healing in the anastomosis cavity may improve the outcome of DCR by preventing excessive fibroblast proliferation and scarring.

Fibroblasts are the central cells in the scarring mechanism. The most important steps in wound healing are the proliferation, migration, and extracellular matrix production by these cells.

Antifibrotis like Mitomycin C (MMC) and 5-Fluorouracil, were first used for modulation of the wound healing proccess in the early 1980s. Mitomycin C's alkylating properties inhibit DNA replication, which led to its use first as an anti-cancer drug. Most of the studies on MMC's efficacy followed a clinical work done by Chen (55).

**What is Mytomycin C (MMC)?**

Mitomycin C (MMC) is obtaned from the bacteria Streptomyces caespitosus.It acts as a bioreductive alkylating agent. Oxygen radicals are generated by a bioreduced MMC which alkylates DNA, and produces interstrand DNA cross-linking resulting in inhibition of DNA synthesis.It is preferentially toxic to hypoxic cells. MMC at high concentrations also inhibits RNA and protein synthesis. It inhibits fibroblast collagen synthesis by inhibition of DNA dependent RNA synthesis.

It is used systemically as an anti cancer agent for the treatment of GIT malignancies,breast cancer, urinary bladder carcinoma, non-small cell lung cancer and many others.

Serious side effects in systemic use noted are haemolytic uremic syndrome, bone marrow suppression, hepatic and renal toxicity. Accidental skin exposure can cause ulceration and necrosis of the area or can erode vessels leading to haemorrhage.

Mitomycin-C should not routinely be administered to patients who are pregnant, who could be pregnant or to nursing mothers. Animal studies have shown teratological changes (56).

**Clinical Efficacy of Mitomycin C**

The antifibrotic action of MMC has been now established and application in ophthalmology include glaucoma surgery, pterygium excision, refractive corneal surgery, conjunctival neoplasia and cicatricial eye disease (57)(58).

With the clinically used concentrations MMC inhibits or causes apoptosis of the fibroblast cells involved in the scarring respone of tenons capsule (59).

A 2005 Cochrane review (60) of the use of intraoperative MMC in Glaucoma filtration surgeries showed to reduce the risk of surgical failure rates in eyes at high risk for failure and primary trabeculectomies. There was no significant increase in other side effects with its use.

Hu et al (61) studied the effect of MMC on cultured human nasal mucosa fibroblasts. The inhibition rates of 0.4 mg/ml MMC for 5-minute duration of exposure was 31%.

He concluded that short exposure to MMC causes cytotoxicity, inhibits proliferation and also increases apoptosis of fibroblasts. Fibroblast apoptosis decreases the amount of cells available for proliferation and decrease product secretion for scarring. He also suggested that his study was in vitro study and greater concentrations than 0.5 mg/ml could be required to have a clinical efficacy when used in DCR.

Yalaz et al (62) evaluated the effects of antifibrotic agents on the fibrous tissue at the site of surgical rhinostomy in external DCR. 60 cases of PANDO were grouped to 3 groups of 20 each. MMC was applied to the first group (0.5 mg/ml to 10 and 1 mg/ml to 10 cases).The second group received 5-flourouracil (2.5 mg/ml to 10 and 5 mg/ml to 10 cases). The control group was 20 cases.

A successful outcome in MMC and 5FU groups was reported as 95% and 90% respectively. The average follow-up time was 15 months. The tissues obtained during the revision of failure cases were evaluated by light and electron microscopy.Light microscopy of the tissues showed hypo and acellular areas to be dominant in the antiproliferatives groups and an increased fibroblastic activity among the controls.

Electron microscopy revealed fibroblasts with scanty cytoplasms poor in organelles and nuclear fragmentation, necrosis or pyknosis in the antifibrotics group.

## Results of previous studies using MMC in External DCR

*Qadir et al* (63) studied 50 cases of PANDO and divided them to MMC group and Control group of 25 patients each. He used 0.2mg/ml MMC intraoperatively in external DCR for 5 minutes. Subjective symptoms, tear meniscus height and syringing of ducts were done to assess the results. The subjective and anatomical success rates were 96 % in MMC and 80% in control group respectively at 6 months follow up. There was no statistical difference between the outcomes between the two groups.

*Satish et al* (64) did a prospective randomised control trial on 60 patients with PANDO. They used 0.2mg/ml MMC intraoperatively for a duration of 5 minutes. Subjective symptoms, tear meniscus height and syringing of ducts were done to assess the results. They reported a statistically significant higher success rate of 96% in MMC group at 6 months follow up compared to 73% in the control group. They thus reported a slightly lower percentage of success in control group as compared to studies done earlier.

*Deka et al* (65) did a comparative study of 60 cases and divided them into 3 groups of 20 each. Group 1 received no MMC while Group 2 and 3, MMC at a concentration of 0.05 mg/mL and 0.4 mg/mL respectively was used for 2 min. A single-flap DCR was performed for half of the cases in each group and double-flap technique for other half.

Endoscopic nasal evaluation was done at day 1, 2 weeks and at 6 months post operatively. At the end of the final follow up, symptomatic relief had no significant difference among the three groups.

Size of the ostium was found to be more in group 3 (17.5$mm^2$) compared to Group 2 (4.8$mm^2$) and Group 1 (3.6$mm^2$) in the single flap group. No statistically significant difference was observed between the rhinostium size in single and double flap DCR.The overall success rate was 90 % in control group and 95% each in MMC groups, which was not statistically significant.

*Kao et al*(66) studied 15 eyes with PANDO and used 0.2mg/ml MMC for 30 minutes. Symptomatic success in the MMC group was 100% and that in controls was 87.5%. 2 patients in the control group was found to have septo-osteotomy adhesion but for none in the MMC group. Although immediate postoperatively,the surface area of the ostium showed no significant difference among 2 groups, bigger ostium was noted at 6 months in MMC group which was statistically significant.

*You et al* (67) studied 50 cases and divided them into a control group and 2 MMC groups. Two MMC groups received 0.2 mg/ml MMC (group 1) or 0.5 mg/ml MMC (group 2) at osteotomy site for 5 minutes. At final follow up visit, ducts were patent in 83% of the control group, 100% in MMC group 1, and 94% in MMC group 2. The average ostium size was 22.2 $mm^2$ in MMC group 1, 20.6 $mm^2$ in MMC group 2, and 13.2 $mm^2$ in controls. The difference in the mean ostium size between MMC and control arms was significant at 35 months follow up. But between the two MMC arms, no statistically significant difference was observed.

*Liao et al* (68) studied 88 patients. In the MMC group, 0.2 mg/ml MMC was applied to the rhinostomy site for 30 minutes duration. The outcomes were objective findings such as irrigation and the height of tear meniscus and subjective improvement of watering.A statistically significant difference between groups at 10 months follow up was noted. Subjective success was 95.5% in MMC group while it was 70.5% in the control group at 10 months follow up; 4.5% and 11.4% was the duct non-patency rate on syringing in MMC and control groups respectively.

*Ari et al* (69) did a prospective randomised control trial of 100 cases and intraoperative MMC 0.2 mg/mL was kept at the rhinostomy site for 30 minutes in the MMC group. The outcome measures were objective findings, irrigation and the improvement in height of tear meniscus, and subjective symptoms.90% in the MMC group and 66% the control group were symptom free at 1-year follow up which was significant( $P$=0.005).The patency success rates were greater in the MMC group than the control group 96% vs 84%( $P$=0.005) which was also significant.

*Yildrim et al* (70) did a randomised control study of 40 eyes with 20 receiving 0.2mg/ml MMC for 30 mins .Follow up period was 1 year.18/20 (90%) eyes in the MMC group had no watering and 1 patient (5%) had an improvement. While in the control group, only 12/20 (60%) eyes had no symptoms and 5 (25%) of the eyes had an improvement. Success rate was 85% in controls and 95% in MMC group with regard to patency of ducts at 1 year follow up but difference did not reach statistical significance.

*Roozitalab et al* (71) studied 130 patients and divided them into 2 groups.MMC group received 0.2mg/ml MMC for 30 mins.Outcome measures were subjective symptoms and the tear meniscus height, fluorescein dye disappearance test, and duct patency. Objective and subjective success rates in the MMC group was 90.5% (59/65), and in the conventional group was 92.4% (60/65) at 6 months follow up. The two groups showed no significant difference in outcomes.Thus it was concluded that in DCR, intraoperative MMC does not improve its success rate.

*Gonzalvo et al* (72) studied the effect of intraoperative MMC in external dacryocystorhinostomy (DCR), and osteotomy size with helical computed tomography (HCT).He studied 17 patients. HCT scans were performed within 24 hours after operation and then at 1, 3 and 6 months to assess the osteotomy size. He used 0.2mg/ml MMC for 2 mins.

100% patients remained asymptomatic in the MMC group and 75% in the controls. The percentage of the remaining osteotomy size in comparision with the size immediately after surgery in the MMC group at the end of 6 months was 93.8 % whereas that of the control group was only 64.8 % ($p<0,001$). These statistically significant differences were noted at 1, 3 and 6 months concluding that MMC is effective in reducing the shrinkage rate of the rhinostomy after DCR.

*Rahman et al* (73) studied 90 patients with PANDO and placed 0.2ml/mg MMC during external DCR for 10 minutes.There was no control group. At 6 months follow up,he reported a functional and anatomical success rate of 97%.

*Feng et al* (74) recently did a comprehensive meta analysis to assess the efficacy and safety of local application of intraoperative MMC at the osteotomy site in primary external dacryocystorhinostomy. Nine RCTs reporting on a total of 562 DCRs were included in the meta-analysis.

Results showed a significantly better success rate in the MMC group compared to the control group (p = 0. 01). In two RCTs, the mean osteotomy size 6 months postoperatively was significantly larger in the MMC group than in the control group. No intraoperative or postoperative complications except two cases with delayed healing of the external skin wound were recorded in the MMC group. Further prospective, randomized studies involving larger patient numbers were suggested.

**Table1- Previous studies using MMC in EXT-DCR and their results**

| Author | Year | Country | Type | Sample size | Success MMC % | Success Control % | Conc MMC mg/ml | Duration MMC min | F/U months | Result |
|---|---|---|---|---|---|---|---|---|---|---|
| Quadir | 2013 | India | CC | 50 | 96 | 80 | 0.2 | 5 | 6 | - |
| Satish | 2013 | India | RCT | 60 | 96 | 73 | 0.2 | 5 | 6 | + |
| Ari | 2009 | Turkey | RCT | 100 | 96 | 84 | 0.2 | 30 | 12 | + |
| Yildrim | 2007 | Turkey | RCT | 40 | 95 | 85 | 0.2 | 30 | 12 | - |
| Rahman | 2006 | Pak | CS | 90 | 97 | - | 0.2 | 10 | 6 | |
| Deka | 2006 | India | CC | 60 | 95 | 90 | 0.4 | 2 | 6 | - |
| Roozitalab | 2004 | Iran | CC | 130 | 90 | 92 | 0.2 | 30 | 6 | - |
| You | 2001 | China | CC | 50 | 100 | 83 | 0.2 | 5 | 35 | + |
| Gonzalvo | 2000 | Spain | CC | 17 | 100 | 75 | 0.2 | 2 | 4 | - |
| Liao | 2000 | Taiwan | CC | 88 | 96 | 89 | 0.2 | 30 | 10 | + |
| Yalaz | 1999 | Turkey | CC | 60 | 100 | 90 | 1 | - | 15 | - |
| Kao | 1997 | China | CC | 15 | 100 | 87 | 0.2 | 30 | 6 | - |

*Result + means significant difference and – means no significant difference

CC-comparative study;RCT-randomised control trial;CS-case series

**Efficacy of MMC in Endonasal DCR (EN-DCR)**

Numerous studies have come out regarding the use of Mitomycin C as an adjuvant in both Primary and Revision Endonasal DCR.

Some investigators like Qin et al (75) ,Ozkiriş et al (76) and Rekha Mudhol et al (77) have reported improvement in the success rate of Endo-DCR with the use of MMC, whereas others like Prassannaraj et al (78), Tirakunwichcha et al (79) and Farahanai et al(80) suggested that intraoperative MMC in Endo-DCR surgery did not improve the success rate of surgery.

Very recently, meta analysis and systematic review to evaluate the efficacy of intraoperative mitomycin C application in both Primary and Revision Endo-DCR surgery was done by Cheng et al (81).They did a systematic search on PubMed, Cochrane Central Register and Embase from January 1990 to December 2012. 11 comparative studies (9 RCTs and 2 non-RCTs) were part of the meta-analysis and comprised a total of 574 eyes.

The average follow-up period was from 6 to 18.2 months. 0.2- 0.5 mg/ml MMC was applied at the rhinostomy site for 2 to 15 minutes.

The overall success rate was 90% in the MMC surgeries and 79% in the controls which was significant ($p = 0.004$) except in the subgroup of silicone intubation Endo-DCR. The measured rhinostomy size was significantly larger in the MMC group than the control group at 3 months ( $p = 0.041$) and 6 months ($p = 0.008$). But, this difference became negligible at 12 months after surgery ($p = 0.072$). No complications were reported related to MMC use in any study.

**Efficacy of MMC in Revision DCR**

Yeatts et al (82) used 0.3mg/ml MMC to the fistula site of 8 cases of failed External DCR for 3 minutes.The mean follow-up period was 14.6 months. He reported an overall success rate of 100%.No postoperative complications associated with the use of Mitomycin C were observed.

In the Cheng et al (81) meta analysis, in the sub group of Revision Endo DCR, four studies on 144 eyes were analysed. The studies included were Oskiris et al(76), Zilelioglu et al (83), Penttila et al (84) and Ragab et al (85).Of these, only Oskiris study showed a standalone significant difference between the two groups while other studies could not prove significance. But the overall meta analysis result showed that significantly higher ($p = 0.029$) success rate was in the MMC group.

# PATIENTS AND METHODS

## Study Design

This study is a randomized, parallel group, placebo controlled double blind trial.

## Study Population

Our study population was the patients attending the outpatient department of our hospital and also those attending the outreach camp clinics.The patients from Vellore and neighbouring districts of Chitoor,Kancheepuram and Thiruvannamalai were recruited after informed consent and if found willing for a follow up as per the study guidelines.

## Setting

The study was conducted from 25$^{th}$ October 2012 till 31$^{st}$ October 2013 in the Department of Ophthalmology,Christian Medical College,Vellore,TamilNadu,India.A feasibility study regarding the default technique to be followed and the duration,concentration and placement of MMC was done prior to submitting the proposal for IRB clearance.

## Inclusion Criteria

Participants who are of age 18 years and above with Primary Acquired Nasolacrimal Duct Obstruction (PANDO).

## Exclusion Criteria

1.Secondary causes of Nasolacrimal duct obstruction

- Trauma

.Nasal pathologies like

- Symptomatic Deviated Nasal Septum
- Active Sinusitis
- Nasal polyps
- Nasal Tumors
- Atrophic rhinitis

2. Revision DCR

3. DCR with Stents

4. Renal failure or Immunosuppression

5. Pregnancy and lactation

6.Past Radiation Therapy

7.Past Chemotherapy

8. Out station patients not able to come for follow up

9. Patients who did not consent for the enrolment into the study

## Pre Operative Evaluation

- History
  - Relevant history of patient's main complaints
  - Past history suggestive of dacryocystitis and its management
  - Any ENT complaints
  - Any Co-morbidities like Diabetes mellitus,Hypertension, Keloid tendencies,Bleeding tendencies
  - Any antiplatelent or anticoagulation therapy
  - Past Ocular /Lacrimal/ENT surgeries.
  - Past Local Radiation therapy/Chemotherapy

- Best Corrected Visual Acuity
- Regurgitation on Pressure Over Lacrimal Sac (ROPLAS)
- Complete Slit-lamp Anterior and Posterior Segment Examination
- **Munk's score of Epiphora** (86)

Grade 0 -No epiphora

Grade 1- Occasional epiphora requiring dabbing less than twice a day

Grade 2 -Epiphora requiring dabbing two to four times per day

Grade 3- Epiphora requiring dabbing 5–10 times per day

Grade 4- Epiphora requiring dabbing more than 10 times per day

Grade 5- Constant tearing

- **Fluorescein Dye Disappearance Test (FDDT)** (87)

Fluorescein strip wetted by 1 drop of Hydroxypropyl Methyl cellulose 3% artificial tears is touched on inferior conjunctival cul de sac.Both eyes are tested simultaneously.The patient is kept from wiping or dabbing tears.The dye disappearance test is graded at 5 minutes on a scale from 0 to 4+ ; 0 represents no dye remaining and 4+ indicates that virtually all of the dye remains. While 1+ or 0 represents minimal or no residual amount of the dye,a residual amount of 2+ to 4+ is considered an indication for inadequate lacrimal drainage.

- Syringing of the Nasolacrimal Duct

## Technique of External Dacryocystorhinostomy

**Pre Operative Evaluation**

Haemoglobin levels

Blood sugar

Blood Pressure

Anterior Rhinoscopy – done with Thudicam speculum to rule out any intra nasal pathologies as listed in the exclusion criteria.

**Pre operative Medication**

Injection Fortwin 1ml+ Phenergan 1 ml is given intramuscularly half an hour prior to the start of surgery.

**Anaesthsia**

Local anesthesia is given by both infiltration as well as topical application. For infiltration 2% lignocaine with 0.5% Bupivacaine with or without adrenaline is used. Infratrochlear nerve that supplies the lacrimal apparatus is blocked first. The supraorbital notch is palpated and the needle is inserted into the lateral edge of the medial third of the eyebrow and advanced to just medial to medial canthus and 2cc of the drug is injected. The tissue along the anterior lacrimal crest is infiltrated subcutaneously and the needle enters deeper at about 3 mm medial to medial canthus, and without withdrawing the needle the drug is injected into deeper tissues up to periosteum both superiorly and inferiorly. A drop of topical proparacaine is placed in conjunctival cul de sac for intraoperative comfort.

The nose is packed with a ribbon gauze soaked with 0.5% Oxymetazolin and 4% Lignocaine. The forceps should guide the ribbon gauze from the external nare superiorly and backwards so that it reaches the middle meatus, the site of ostium.

**Incision** (colour plate pic 2)

After cleaning and draping, A straight 15 mm skin incision is made 10-12 mm nasal to the medial canthus and tangential to the inferonasal rim of orbit.

**Sac Dissection**

The orbicularis muscle is bluntly dissected, avoiding the angular vessels and the anterior limb of medial canthal tendon and periosteum are exposed. The skin and the orbicularis muscle are retracted medially and laterally with 4 stay sutures.. The anterior limb of the medial canthal tendon is incised exposing the lacrimal sac. The periosteum is incised and reflected posteriorly with theTraquair's periosteal elevator. Anterior lacrimal crest and lacrimal fossa are exposed upto the posterior lacrimal crest.

**Bony ostium creation** (colour plate pic 3)

After the exposure of the lacrimal fossa, the Traquair's periosteal elevator is used to pierce the bone at the junction of lamina papyracea of the ethmoid and lacrimal bone or at the suture between the frontal process of maxilla and the lacrimal bone.Care is taken at this step not to damage the nasal mucosa. The Kerrison bone punch is gently inserted between the bone and the nasal mucosa and the ostium sequentially enlarged to around 12-15 mm size in both vertical and antero-posterior dimensions.

The extent of the ostium can be up to

a. Anteriorly till the punch cannot be inserted between the bone and the nasal mucosa.
b. Posteriorly till removal of aerated ethmoid.
c. Superiorly till 2 mm above the medial canthus.
d. Inferiorly till the nasolacrimal canal is partly de-roofed.

**Test Solution** (colour plate pic 5 )

The test solution was normal saline as placebo or 0.4mg/ml MMC as the interventional agent. This was soaked in a cottonoid and kept at the ostium site for 5 minutes.The ostium was thoroughly irrigated with 20 ml of normal saline.5 ml normal saline was used to irrigate the cornea and conjuctival sac.

**Flap formation**

We followed the single anterior flap technique.

The first step is to create sac flap. A Bowman's probe is passed through the lower punctum and bent in such a way to tent the sac as posterior as possible to create a large anterior flap. Using the probe as guide, incision is made with the help of a number 11 Blade right across the sac from the fundus to the nasolacrimal duct. The incision is extended anteriorly from the two edges and the flap is raised.

The second step is to fashion the nasal mucosal flap. With the help of number 11 blade, incisions are made in the nasal mucosa along the bony ostium except anteriorly to have a hinged flap.

**Flap Anastomosis**

The Nasal and Sac flaps are sutured edge to edge with 5-0 catgut.1 or more interrupted sutures are used depending on the size of the flaps.

**Wound Closure**

The orbicularis muscle is sutured with the same 5-0 catgut interrupted sutures. Skin is closed with interrupted 5-0 silk. Antibiotic ointment is applied to the wound and a sterile dressing is kept.

## Immediate Post Operative Care

On the 1st post-operative day,the nasal pack and wound dressing is removed.The wound is cleaned with Betadine and left open.Patient is discharged on topical antibiotics and steroid drops for 1 week and analgesics .Oral antibiotics are not administered routinely unless there are signs of active infection.

## Outcome measures

Subjective assessment of watering symptom –Munk Scoring of epiphora

Functional assessment of lacrimal system-Fluorescein Dye Disappearance Test

Anatomical patency –Syringing with Normal saline

## Definition of Success

- Subjective success was defined as substantial improvement to no watering or occasional watering requiring dabbing less than twice a day ie Munk Grade 0 and 1.
- Objective success was taken as Fluorescein dye disappearance test Grade of 0 or +1 indicating adequate tear drainage.
- Anatomical patency was taken as fully or partially free flow on syringing of the ducts.

Overall success was defined as fully or partially patent lacrimal system with subjective improvement in tearing and objective improvement in tear drainage.

## Follow up

Patient was followed up at

- 1 week +/- 4 days
- 1month +/- 1 week
- 3 months +/- 2 weeks

Sutures were removed at the 1st visit

Munk scoring,FDDT grading and Syringing were done at each visit.

## Method of Randomisation

Computer generated block randomization with variable block sizes of 4, 6 and 8.

## Blinding

Patient, Principal Investigator (PI),Surgeon and the Outcome Assessor were masked in the study.

The patient is unaware of which study group he/she belongs until the final follow up is over. Serially numbered sealed opaque envelopes were kept in safe custody of the theatre in-charge nurse. When a DCR was told to be included in the study, he would open the envelope and prepare the appropriate solution to be used. The solution is then handed over to the scrub nurse without revealing the study arm .The surgeon also is masked as to what solution is being given. The post operative follow up evaluations were done by the Outcome Assessor, who was the PI in this case, being still masked. The theatre in-charge nurse keeps a file of all the patients and solution used which will be revealed to the PI only after 3 months follow up is completed for each patient.

## Method of Allocation Concealment

Opaque sealed envelopes were used to conceal the sequence of random allocation. The envelopes were opened after recruitment of participant into the study.

## Institutional Review Board Approval

The study protocol was approved by the Institutional Review Board constituted as per the ICMR Guidelines. (Appendix A)

## Funding source

Our study was funded by the institution's Fluid Research Grant. No funding was received from any external source.

## Clinical Trials Registry – India

This study is registered with the Clinical Trials Registry India. It was registered on 06/02/2013. The trial number is CTRI/2013/02/003352. (Appendix E)

## Sample size Calculation

It would require 435 subjects in each study arm to show a statistically significant improvement in the success rate of external DCR from 90% to 95% with the application of MMC.Given the time constraints of a dissertation, this trial was initiated as a pilot study with a sample size of 90, ie 41 in each arm + 8 (10% attrition rate).We plan to continue this study in our department over the coming years.

| **Two Proportion - Hypothesis Testing - Large Proportion - Equal Allocation** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Average success rate of all previous studies** | **Average success rate of all previous studies with 1 sided alpha** | **Deka** | **You** | **Liao** | **Gonzalvo** | **Gonzalvo 1 sided α** | **Gonzalvo with 90 power** |
| **Proportion in MMC group** | **0.97** | **0.97** | **0.95** | **1** | **1** | **1** | **1** | **1** |
| **Proportion in Control group** | **0.86** | **0.86** | **0.90** | **0.83** | **0.89** | **0.75** | **0.75** | **0.75** |
| **Estimated risk difference** | **0.11** | **0.11** | **0.05** | **0.17** | **0.11** | **0.25** | **0.25** | **0.25** |
| **Power (1- beta) %** | **80** | **80** | **80** | **80** | **80** | **80** | **80** | **90** |
| **Alpha error (%)** | **5** | **5** | **5** | **5** | **5** | **5** | **5** | **5** |
| **1 or 2 sided** | **2** | **1** | **2** | **2** | **2** | **2** | **1** | **2** |
| **Required sample size for each arm** | **100** | **78** | **435** | **41** | **66** | **26** | **21** | **35** |

## Hypothesis testing of two large proportions Formula-Equal Allocation

$$H_0 : P_1 = P_2; \qquad H_a : P_1 \neq P_2$$

$$n = \frac{\left\{ Z_{1-\frac{\alpha}{2}} \sqrt{2\,\bar{P}\left(1-\bar{P}\right)} + Z_{1-\beta} \sqrt{P_1\left(1-P_1\right) + P_2\left(1-P_2\right)} \right\}^2}{\left(P_1 - P_2\right)^2}$$

Where,

$$\bar{P} = \frac{P_1 + P_2}{2}$$

$P_1$ : Proportion in the first group

$P_2$ : Proportion in the second group

$\alpha$ : Significance level

$1-\beta$ : Power

## Statistical Analysis

The collected data was entered into Microsoft Excel Spreadsheet and was analysed with the aid of SPSS Data Analysis Software version 16.

Mean ±SD was reported for continuous variables such as Age and Ostium, Frequency and % were reported as a descriptive statistics for all categorical variables. To compare the mean between respective groups for Age and Ostium, the Two Independent sample t test was used. All categorical variables were analyzed using Chi-square/Fishers exact test.

Overall success rate was compared with two-propotion Z test. P value $<0.05$ was considered to be statistically significant.

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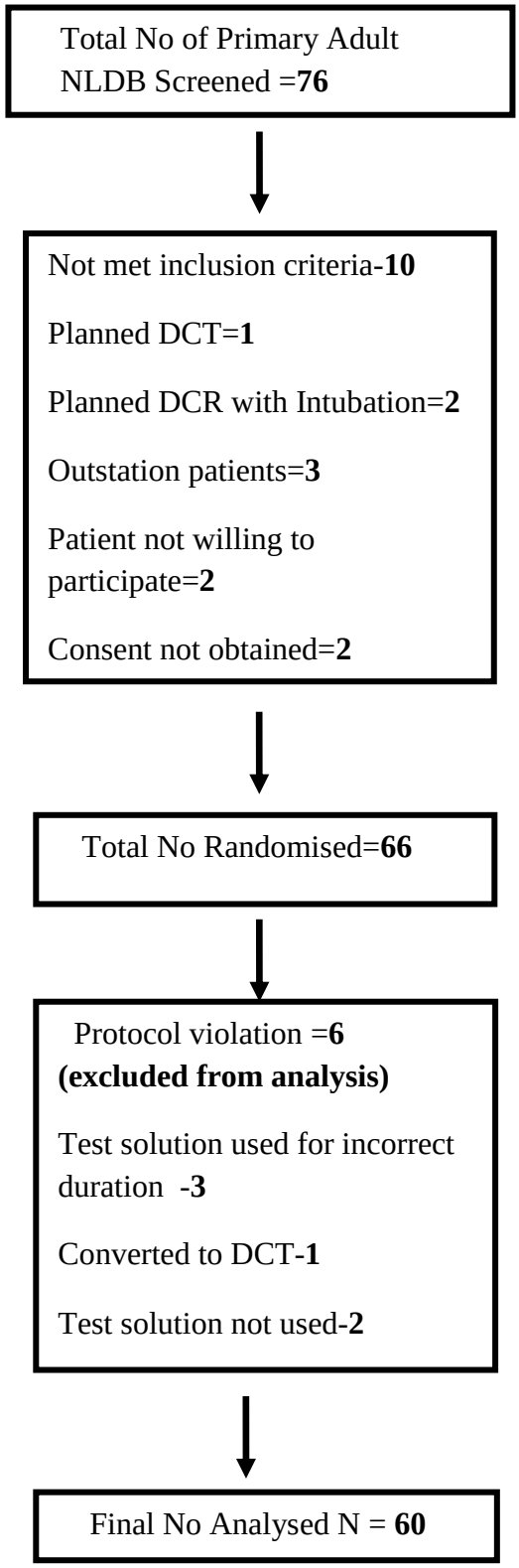
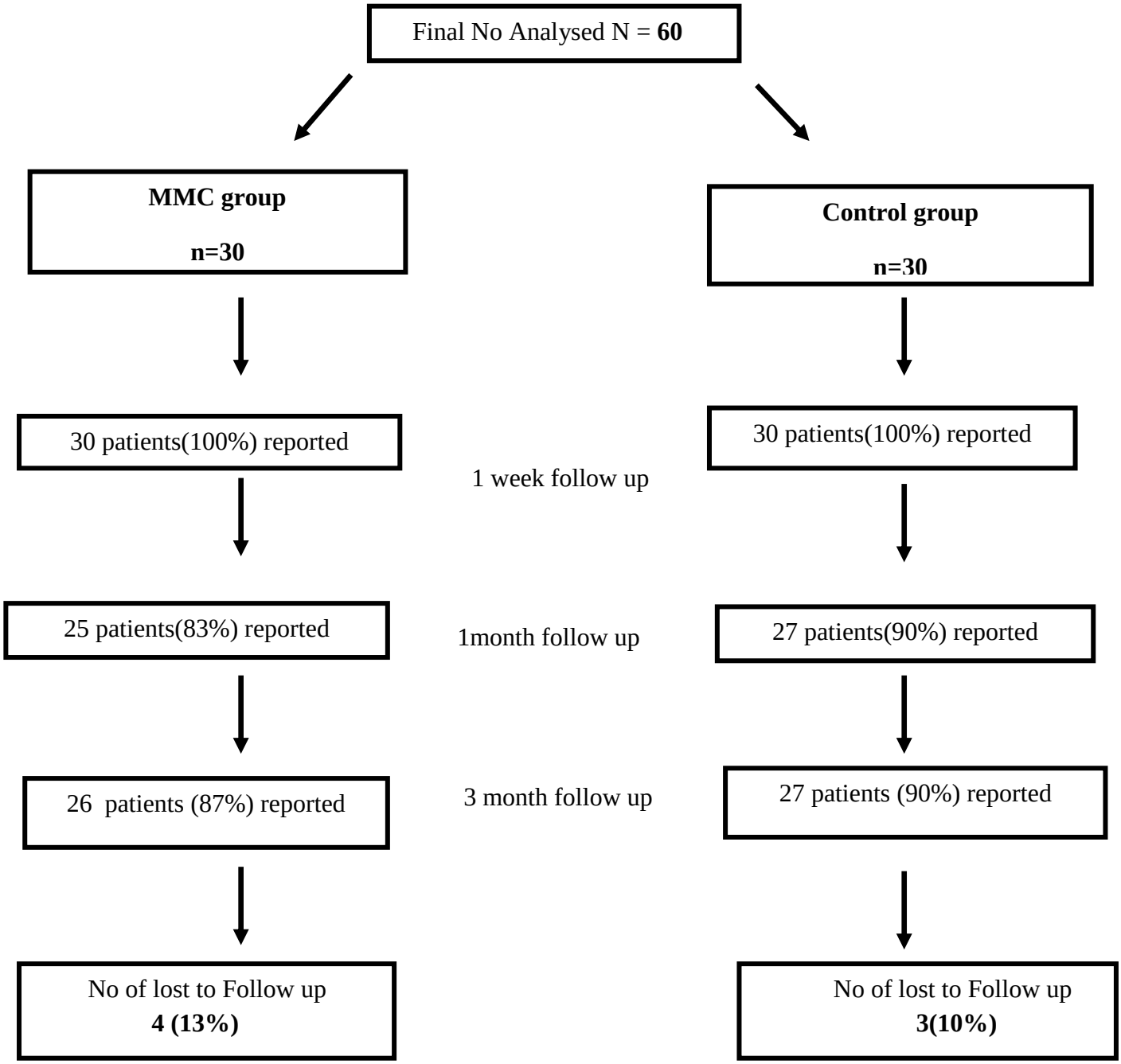
# RESULTS AND ANALYSIS

## Flow Chart of study patients




Final No Analysed N = 60
MMC group
n=30
Control group
n=30
30 patients(100%) reported
30 patients(100%) reported
1 week follow up
25 patients(83%) reported
1month follow up
27 patients(90%) reported
26 patients (87%) reported
3 month follow up
27 patients (90%) reported
No of lost to Follow up
4 (13%)
No of lost to Follow up
3(10%)

# Analysis

**1.Age**

The age of patients included in the study ranged from 22 years to 85 with a mean age of 50.4 ± 15.6 years in the MMC group and 51.4 ± 13.7 years in the Control group.

Most of the patients i.e. 38/60 (63.3%) came under the middle aged category of 40-70 years (Table 2 ,Fig 1).

**Table 2: Age Group distribution among study groups**

| Age Group (years) | MMC n (%) | Control n (%) | P value |
|---|---|---|---|
| 18-30 | 4 (13.3) | 3 (10.0) | |
| 31-40 | 6 (20.0) | 4(13.3) | |
| 41-50 | 4 (13.3) | 7 (23.3) | **0.776** |
| 51-60 | 8 (26.7) | 7 (23.3) | |
| 61-70 | 5 (16.7) | 7 (23.3) | |
| 71-80 | 3 (10.0) | 1 (3.3) | |
| >80 | 0 (0.0) | 1(3.3) | |

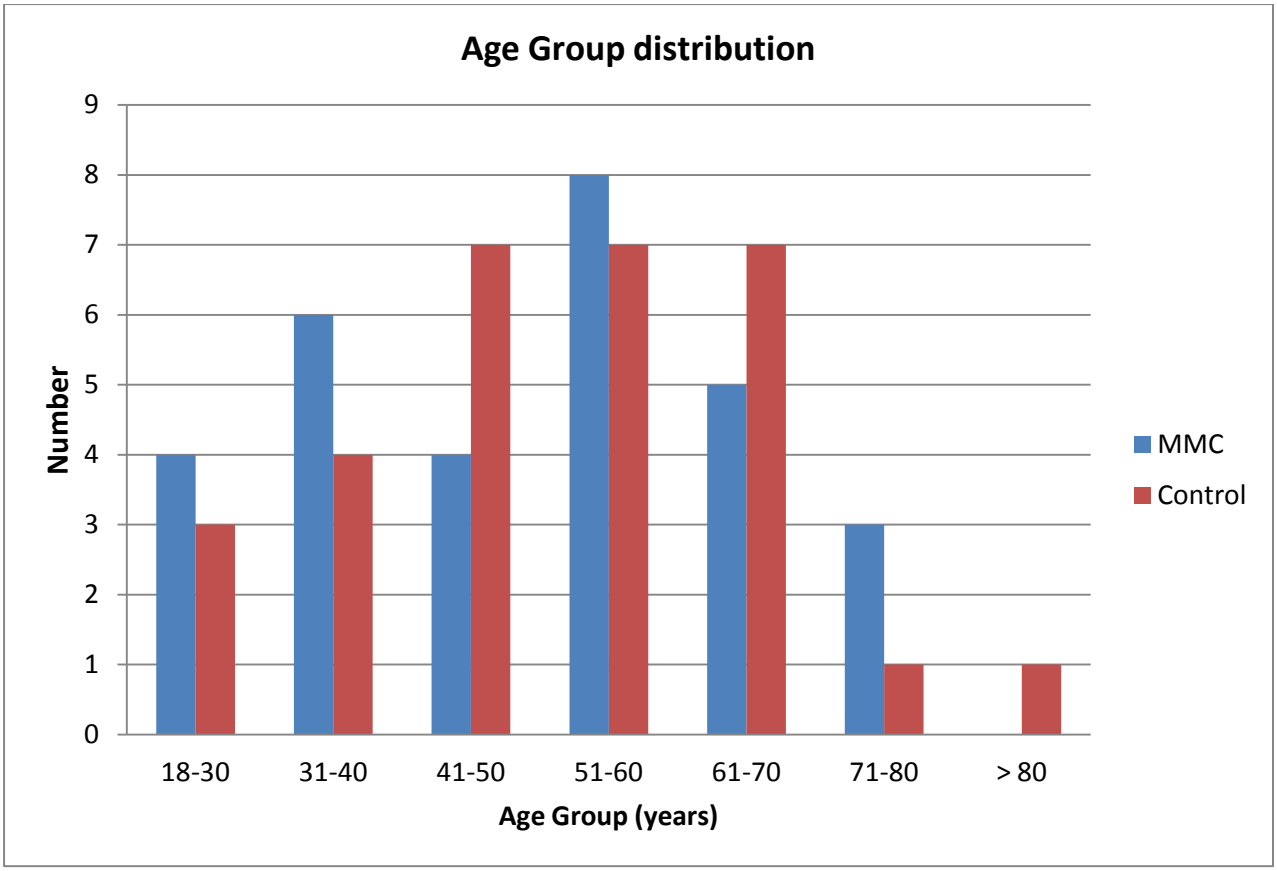



**Fig.1 - Age Group distribution among study groups**

**2.Gender distribution:**

47 out of 60 patients (78.3%) were females and 13 out of 60 (21.7%) were males. They were equally distributed in both arms. Thus there was a female prepoderence in our study.

(Table 3, Figure 2)

**Table 3: Gender distribution among patients**

| Gender | MMC<br>n (%) | Control<br>n (%) | p value |
|---|---|---|---|
| Male | 7 (23.3) | 6( 20) | 0.754 |
| Female | 23 (76.6) | 24 (80) | |

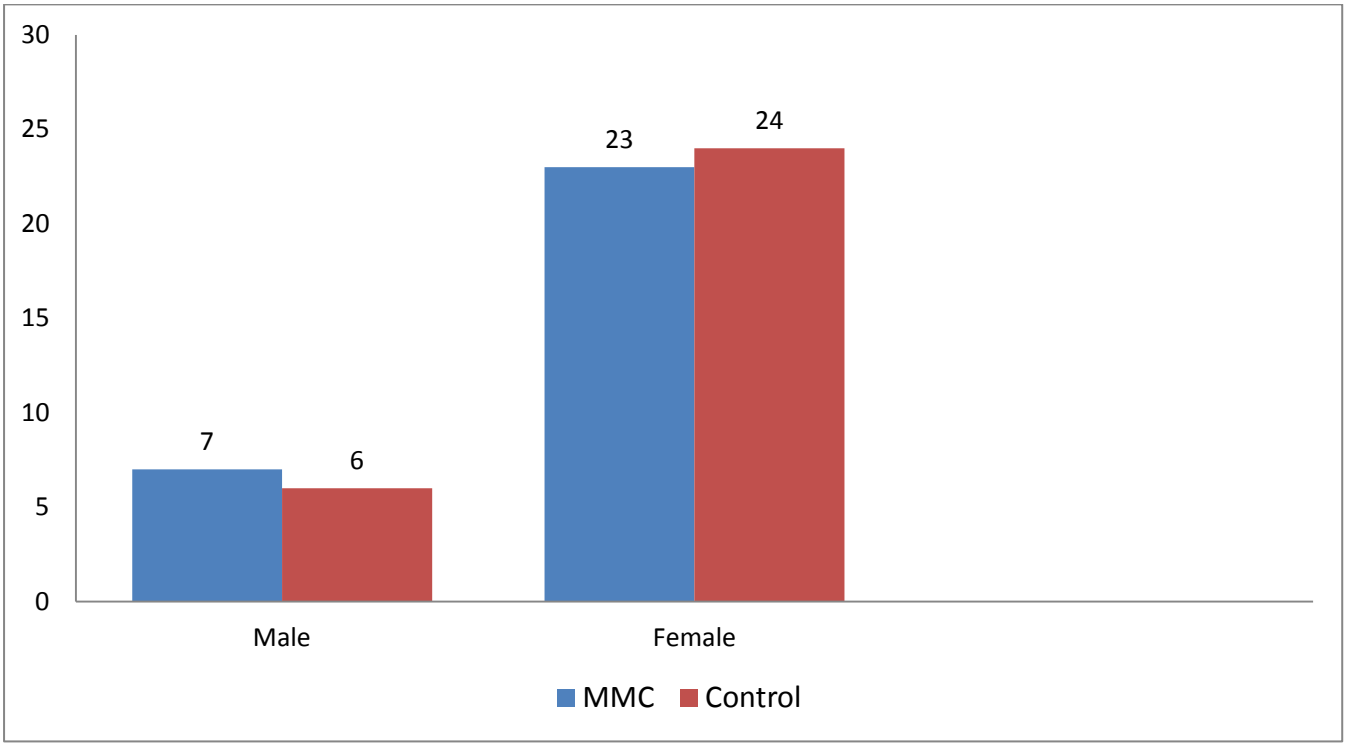



**Fig 2: Gender distribution among patients**

**3.Occupation**:

57 out of 60 patients (95%) were doing either house jobs or manual labour.

(Table 4, Figure 3)

**Table 4: Occupation of patients in each group**

| Job | MMC n (%) | Control n(%) | P value |
|---|---|---|---|
| House Job | 21(70) | 19 (63.3) | 0.779 |
| Manual labour | 7 (23.3) | 10 (33.3) | |
| Business | 1 (3.3) | 1 (3.3) | |
| Others | 1 (3.3) | - | |

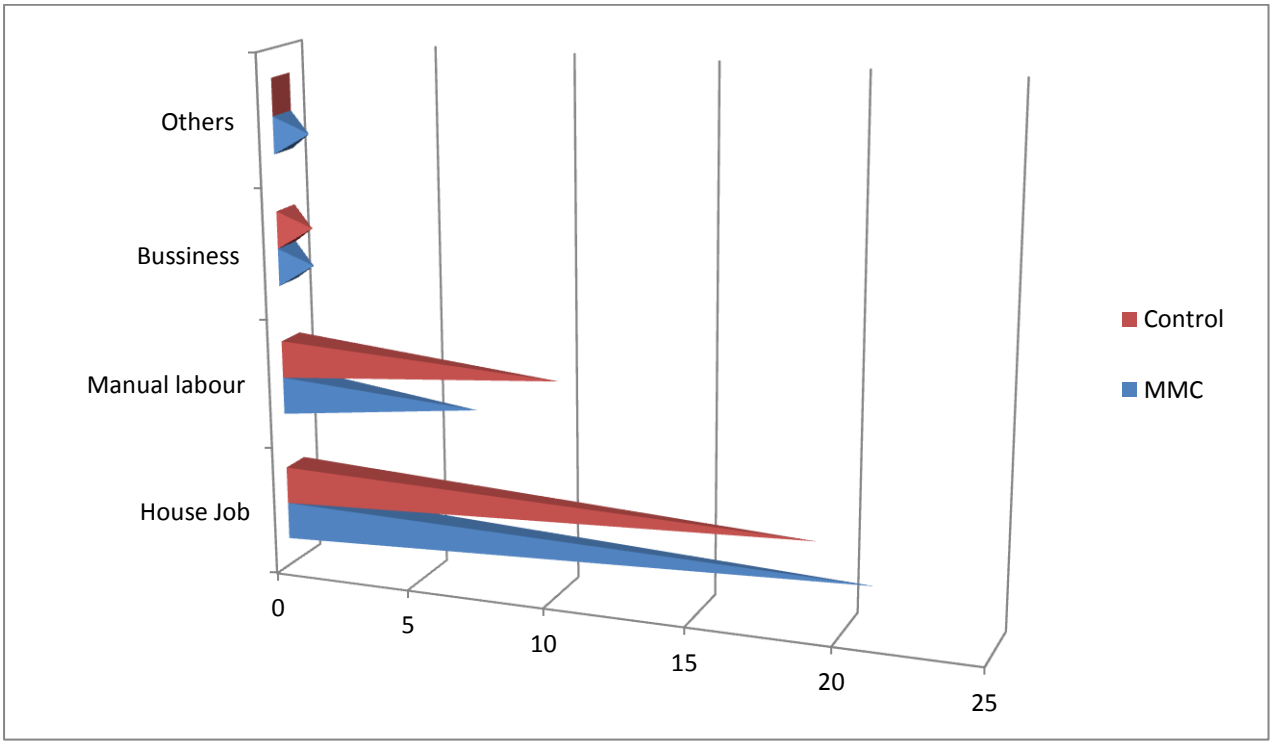



**Fig 3: Occupation of patients in each group**

**4.Socio Economic Status (SES)**

53 out of 60 (88.3%) patients belonged to Low socio economic class and the rest belonged to the middle class. (Table 5, Figure 4)

**Table 5: Socio Economic Status of study patients**

| SES | MMC n (%) | Control n(%) | P value |
|---|---|---|---|
| Low | 26 (86.7) | 27(90) | **1.000** |
| Middle | 4 (13.3) | 3 (10) | |
| High | - | - | |

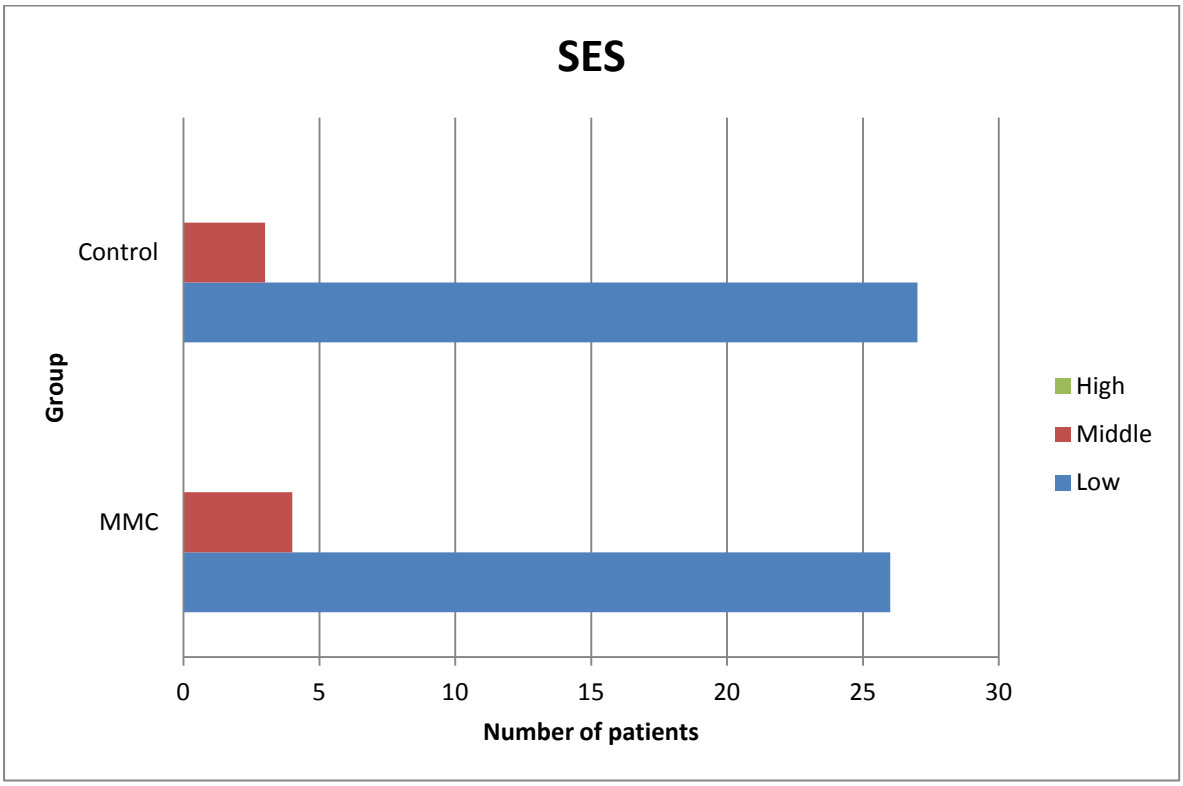



**Fig 4: Socio Economic Status of study patients**

## 5. Demography

78.3% of patients were from Vellore district while the rest were from neighbouring districts of Tamil Nadu,Andhra Pradesh and Karnataka.(Table 6, Figure 5)

**Table 6: Demographic distribution of patients**

| Place | MMC n (%) | Control n (%) | P value |
|---|---|---|---|
| Vellore | 23(76.7) | 24 (80) | |
| Neighbouring Districts | 7 (23.3) | 6 (20) | 0.754 |

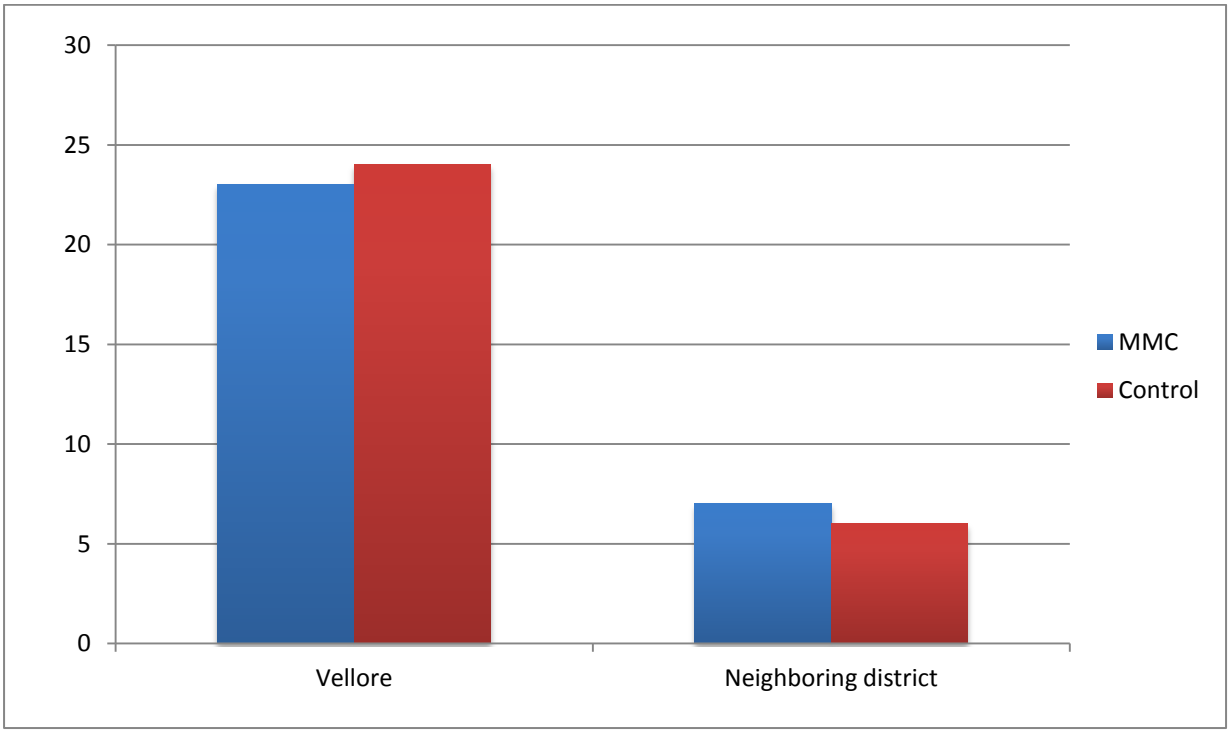



**Fig 5: Demographic distribution of patients**

**6.Co-Morbidities**

The prevalence of Diabetes Mellitus among participants was 13.3% and Hypertension was 11.7%. None had any other systemic illnesses. (Table 7, Figure 6 &7)

**Table 7: Prevalence of Diabetes and Hypertension among patient groups**

| **Co-morbidity** | **MMC n (%)** | **Control n (%)** | **P value** |
|---|---|---|---|
| Diabetes mellitus | 5 (16.7) | 3(10) | 0.706 |
| Hypertension | 6 (20) | 1 (3.3) | 0.103 |

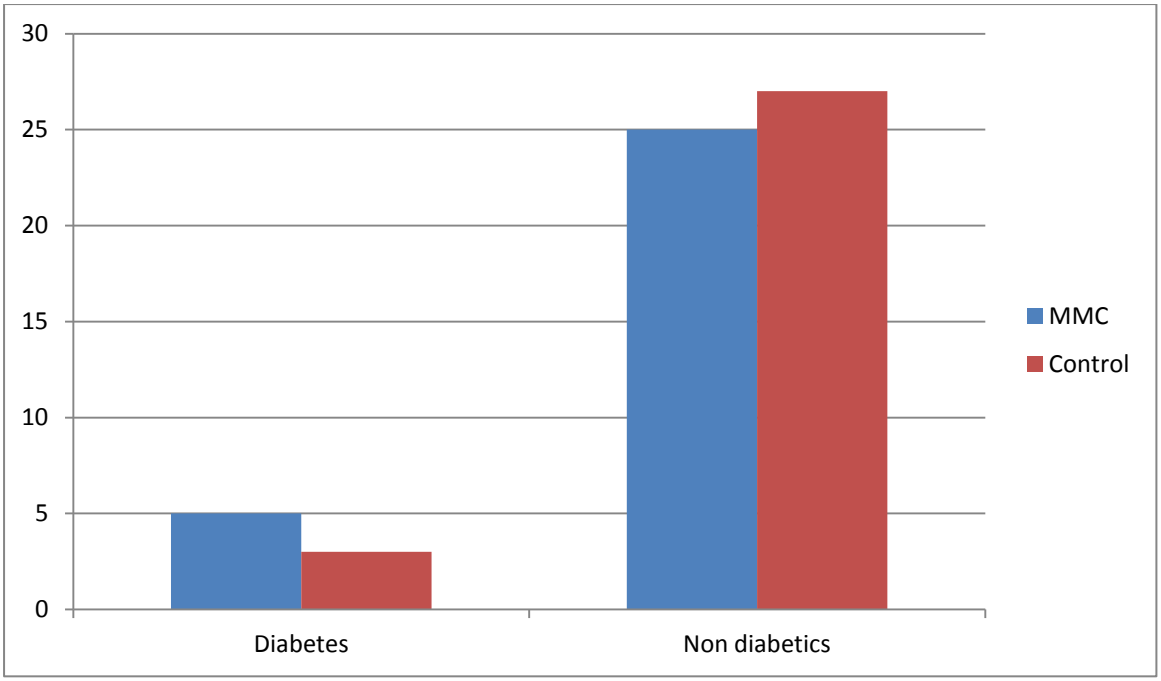



**Fig 6 :Prevalence of Diabetes among patient groups**

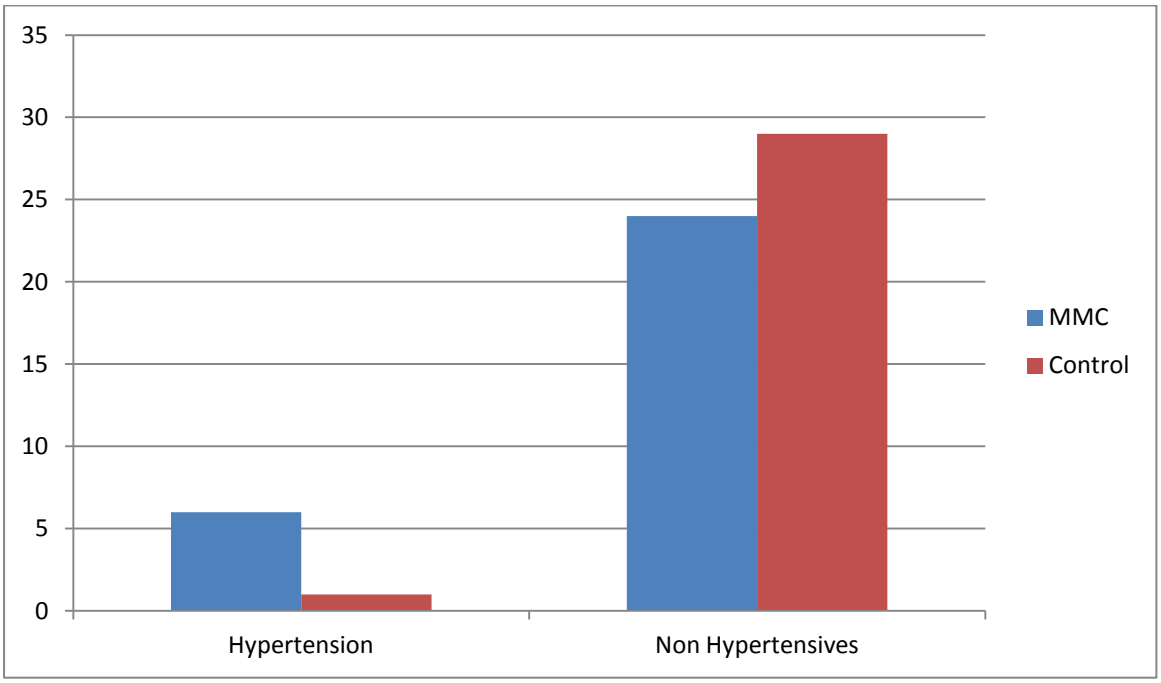



**Fig 7: Prevalence of Hypertension among patient groups**

**7.Anterior Rhinoscopy**

Pre-operative Anterior Rhinoscopy by Thudicam speculum did not reveal any nasal pathology significant enough to be addressed before a DCR surgery.In one patient with Deviated Nasal Septum and spur,the spur was small and did not touch the lateral wall of nose. (Table 8)

**Table 8: Results of Pre op Anterior rhinoscopy**

| **Anterior Rhinoscopy** | **MMC n (%)** | **Control n (%)** | **P value** |
|---|---|---|---|
| Normal | 15(50) | 15 (50) | **1.000** |
| DNS | 15 (50) | 15 (50) | |
| DNS with Spur | 1 (3.3) | 0 (0) | |
| Atrophic Rhinitis | 0 (0) | 0 (0) | |
| Nasal polyp | 0 (0) | 0 (0) | |

**8. Pre-operative Munk score**

Most patients in both arms 93.3% in MMC group and 90% in Control group had constant tearing (Grade 5) according to the Munk Grading System.(Table 9)

**Table 9: Pre operative Munk score among groups**

| **Munk score** | **MMC** **n (%)** | **Control** **n (%)** | **P value** |
|---|---|---|---|
| Grade 1 | - | - | **1.000** |
| Grade 2 | - | 1(3.3) | |
| Grade 3 | 1(3.3) | 1(3.3) | |
| Grade 4 | 1(3.3) | 1(3.3) | |
| Grade 5 | 28(93.3) | 27(90) | |

**9. Pre-operative Fluorescein Dye Disappearance test (FDDT)**

All patients (100%) in MMC group and Control group had inadequate dye clearance after 5 minutes (+2 or more). (Table 10)

**Table 10: Pre-operative Fluorescein Dye Disappearance test score among patient groups**

| FDDT Grade | MMC n (%) | Control n (%) | P value |
|---|---|---|---|
| 0 | - | - | |
| +1 | - | - | |
| +2 | - | 1(3.3) | **1.000** |
| +3 | 2(6.7) | 1(3.3) | |
| +4 | 28(93.3) | 28(93.3) | |

**10. Pre-Operative Ducts Syringing**

All patients in both arms had fully blocked nasolacrimal ducts with a hard touch and fluid regurgitating through the opposite punctum.

**11. Surgeon Factor**

Only 4 out of 60 DCRs (6.7%) was done by Consultants while the rest were done by Registrars. (Table 11)

**Table 11: Surgeon distribution among patient groups**

| **Surgeon** | **MMC n(%)** | **Control n (%)** | **P value** |
|---|---|---|---|
| Consultant | 3(10) | 1(3.3) | **0.612** |
| Registrars | 27(90) | 29(96.7) | |

**12.Intra-operative Ostium Size**

The intra-operative ostium size varied from 81 $mm^2$ to 225 $mm^2$ in our study patients.

The mean ostium size in MMC group was 155.0 ± 24.7 $mm^2$

The mean ostium size in Control group was 149.8 ± 27.1 $mm^2$

There was no significant difference in the ostium sizes between the 2 groups

(Table 12, Figure 8)

**Table 12: Intraoperative ostium size distribution among patient groups**

| Ostium Size $mm^2$ | MMC n(%) | Control n(%) | P value |
|---|---|---|---|
| <120 | 2 (6.7) | 5 (16.7) | **0.441** |
| >121 | 28 (93.3) | 25 (83.3) | |

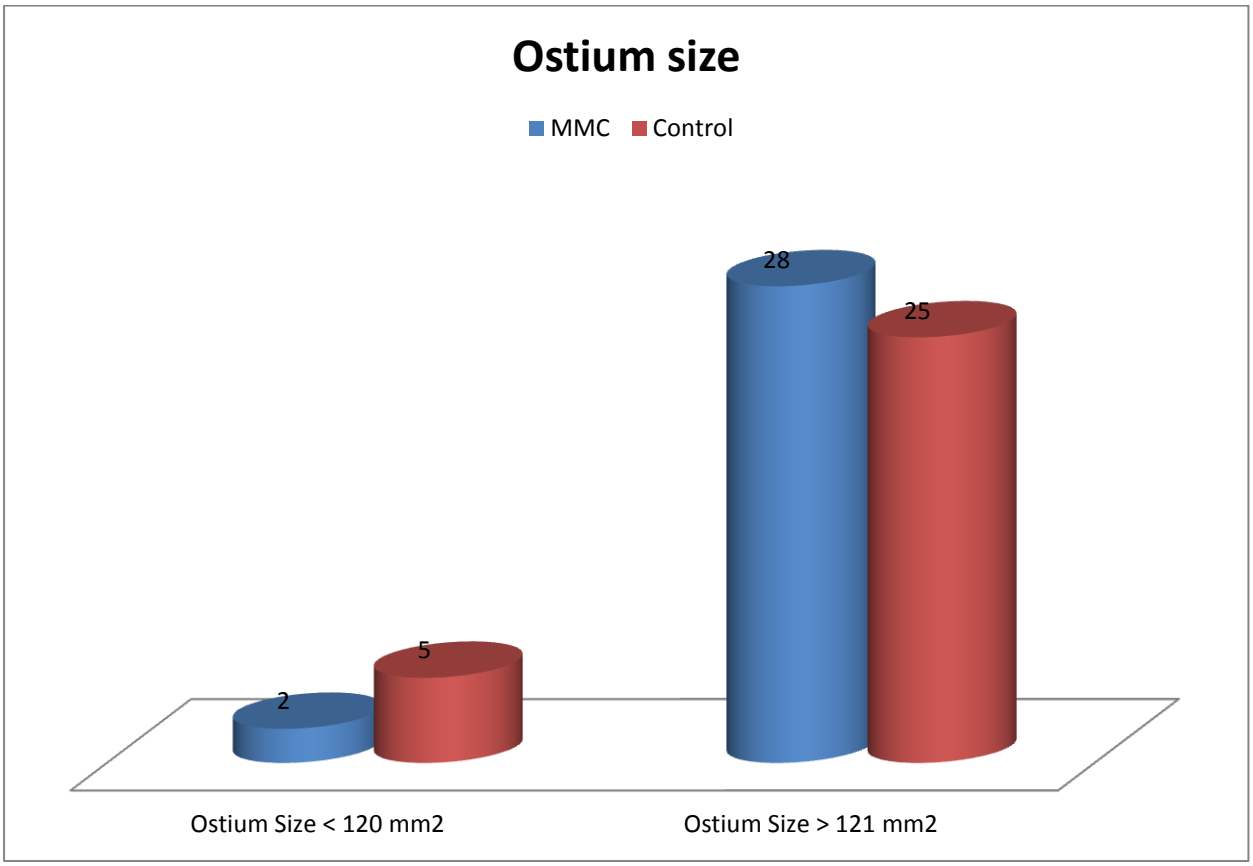



**Fig 8: Intraoperative ostium size distribution among patient groups**

**13. Per-operative Complications**

2 patients in the MMC group had an incomplete nasal mucosal flap.There was no excessive bleeding noted in this group.

One patient in the Control group had an incomplete nasal mucosal flap and one patient had excessive per-operative bleeding and an incomplete nasal flap.The bleeding was controlled with ligation of the angular vein and pressure packing.No other per operative complication occurred during our study. (Table 13)

**Table 13: Distribution of Intra-operative complication among patient group**

| **Complication** | **MMC**<br>**n (%)** | **Control**<br>**n (%)** | **P value** |
|---|---|---|---|
| Nil | 28 (93.3) | 28(93.3) | **1.000** |
| Excess Bleeding | - | 1 | |
| Incomplete flap | 2(6.7) | 2(6.7)* | |

*Same patient had excessive bleeding and incomplete flap.

**14.Follow up**

There was 100% follow up compliance for the 1st follow up visit at 1 week.

There was 86.7% compliance at 1 month follow up.

There was 88.3% compliance at 3 months follow up. (Table 14)

**Table 14:Follow up compliance among patient groups**

| **Visit** | **MMC n(%)** | **Control n(%)** |
|---|---|---|
| 1 week | 30 (100) | 30 (100) |
| 1 month | 25 (83.3) | 27 (90) |
| 3 month | 26 (86.7) | 27 (90) |

**15. Time of Suture Removal**

Suture remvol was generally done within 10th post operative day. In 3 cases of MMC group and 2 cases of Control group,it was done within the 14th post operative day.In all the 5 cases in which sutures were removed beyond 10 days, there was no evidence of wound necrosis and the delay in suture removal was the surgeon's choice because of reasons unrelated to wound health.(Table 15)

**Table 15: Timing of suture removal**

| **Time of suture removal** | **MMC n (%)** | **Control n (%)** | **P value** |
|---|---|---|---|
| 5-10 days | 27 (90) | 28 (93.3) | **1.000** |
| 10-14 days | 3 (10) | 2 (6.7) | |
| >14 days | - | - | |

**16. Result Analysis at 1st week Post DCR**

**Table 16: Post operative outcomes at 1week follow up**

| Test | MMC n=30(%) | Control n=30(%) | P value |
|---|---|---|---|
| **Munk Score** | | | |
| 0 | 22 (73.3) | 21 (70) | **0.854** |
| 1 | 1 (3.3) | 2 (6.7) | |
| 2 | 4 (13.3) | 3 (10) | |
| 3 | 2 (6.7) | 4 (13.3) | |
| 4 | 1 (3.3) | - | |
| **FDDT** | | | |
| 0 | - | - | **1.000** |
| +1 | 21 (70) | 21 (70) | |
| +2 | 6 (20) | 5 (16.7) | |
| +3 | 2 (6.7) | 3 (10) | |
| +4 | 1 (3.3) | 1 (3.3) | |
| **Ducts** | | | |
| Patent | 29 (96.7) | 26 (86.7) | **0.353** |
| Partially patent | 1 (3.3) | 3 (10) | |
| Blocked | - | 1 (3.3) | |

76.7 % patients in both the MMC group and the Control group had a Munk score of 0 or 1 which was our definition of subjective success

All patients in both groups had an improvement in tearing by at least 1 grade.

70% patients in both groups had adequate dye disappearance at 5 minutes. All other patients showed an improved dye disappearance except 1 patient each in both groups.

Syringing showed anatomical patency in all patients in MMC group and 96.7% in Control group

There was no statistically significant difference in success rate between the two groups at 1 week follow up. (Table 17)

**Table 17: 1 week Success rate among both groups**

| **Variable** | **MMC n=30 (%)** | **Control n=30(%)** | **P value** |
|---|---|---|---|
| Subjective success | 23 (76.7%) | 23 (76.7%) | 1.000 |
| Functional success | 21 (70%) | 21 (70%) | 1.000 |
| Anatomical success | 30 (100%) | 29 (96.7%) | 0.287 |

## 17. Result Analysis at 1 month Post DCR

**Table 18: Post operative outcomes at 1 month follow up**

| Test | MMC n=25 (%) | Control n=27(%) | P value |
|---|---|---|---|
| **Munk Score** | | | |
| 0 | 18 (72.0) | 24 (88.9) | |
| 1 | 1 (4) | - | **0.566** |
| 2 | 4 (16.0) | 2 (7.4) | |
| 3 | 1 (4.0) | 1 (3.3) | |
| 4 | 1 (4.0) | - | |
| **FDDT** | | | |
| 0 | - | - | |
| +1 | 18 (72) | 23 (85.2) | |
| +2 | 3 (12) | 3 (11.1) | **0.554** |
| +3 | 3 (12) | 1 (3.7) | |
| +4 | 1 (4) | - | |
| **Ducts** | | | |
| Patent | 21 (84) | 25 (92.6) | |
| Partially patent | 3 (12) | 2 ( 7.4) | **0.497** |
| Blocked | 1 (4) | - | |

Subjective success was 76% in MMC group and 88.9% in control group.

All patients in both groups had a subjective improvement in watering by at least 1 grade.

72% patients in MMC group and 85.2% patients in Control group had adequate dye disappearance at 5 minutes. All patients had an improvement in dye disappearance by at least 1 grade except for 1 patient in MMC group.

Syringing showed anatomical patency in 96% in MMC group and 100% in Control group.

There was no statistically significant difference in success rate between the Control and MMC group at 1 month. (Table 19)

**Table 19:1 month Success rate**

| **Variable** | **MMC n=25 (%)** | **Control n=27(%)** | **P value** |
|---|---|---|---|
| Subjective success | 19 (76) | 224 (88.9) | 0.258 |
| Functional success | 18 (72) | 23(85.2) | 0.252 |
| Anatomical success | 24(96) | 27(100) | 0.484 |

**18. Result Analysis at 3 month Post DCR**

**Table 20: Post operative outcomes at 3 month follow up**

| **Test** | **MMC n=26 (%)** | **Control n=27(%)** | **P value** |
|---|---|---|---|
| **Munk Score** | | | |
| 0 | 21 (80.80) | 24 (88.9) | |
| 1 | 2 (7.7) | 0 (0) | |
| 2 | 3 (11.5) | 2 (7.4) | **0.457** |
| 3 | - | - | |
| 4 | - | 1 (3.7) | |
| **FDDT** | | | |
| 0 | - | - | |
| +1 | 21 (80.8) | 23 (85.2) | |
| +2 | 3 (11.5) | 3 (11.1) | **0.544** |
| +3 | 2 (7.7) | - | |
| +4 | - | 1(3.7) | |
| **Ducts** | | | |
| Patent | 23 (88.5) | 24 (88.9) | |
| Partially patent | 3 (11.5) | 2 (7.4) | **1.000** |
| Blocked | - | 1 (3.7) | |

Subjective success at 3 months was 88.5% in MMC group and 88.9% in Control group. All patients, except 1 patient in control group had an improvement in the tearing score by at least 1 grade.

80.8% in MMC group and 85.2% in Control group had adequate dye disappearance at 5 minutes..All patients except 1 in Control group had an improvement in dye disappearance by at least 1 grade.

Syringing showed anatomical patency in 100% patients in MMC group and 96.3% in Control group.

Thus at 3 month follow up, there was still no statistically significant difference in subjective and objective success rate in both groups. (Table 21)

**Table 21: 3 month Success Rate**

| **Variable** | **MMC** | **Control** | **P value** |
|---|---|---|---|
| | **n=26 (%)** | **n=27(%)** | |
| Subjective success | 23 (88.5) | 24 (88.9) | 0.964 |
| Functional success | 21(80.8) | 23(85.2) | 0.678 |
| Anatomical success | 26(100) | 26(96.3) | 0.321 |

**19.Post operative complications**

There was 1 case in the Control group who had a post operative wound infection which was managed successfully with antibiotics and dressings and it healed well with a Munk score improvement to 2, FDDT score improvement to 2 and partially patent duct on syringing at 3 month follow up.

**20.Overall Success Rate**

A total of 3 patients had fully blocked ducts on syringing,with inadequate dye disappearance. There was also no patient satisfaction with regard to watering.One patient belonged to MMC group and 2 were in the Control group. (Table 22)

Out of them only 2 patients came for 1 month follow up and only 1 patient came for the final visit.

All 3 patients were advised revision DCR surgery.

The overall success rate in the study was 96.7% (29/30) in the MMC group and 93.3 %

(28/30) in the Control group and the difference was not statistically significant (p=0.546).

(Table 23, Fig 9)

.

**Table 22: Analysis of failure cases**

| **Parameter** | **Patient 1** | **Patient 2** | **Patient 3** |
|---|---|---|---|
| Arm | Control | MMC | Control |
| Age(Years) | 61 | 42 | 61 |
| Co-Morbidities | Nil | Nil | Nil |
| Surgeon | Registrar | Registrar | Registrar |
| Intra Op Ostium size ($mm^2$) | 120 | 81 | 110 |
| Intra-operative complication | Nil | Nil | Nil |
| Post-operative complication | Nil | Nil | Nil |

**Table 23: Overall Success Rate**

| MMC group n=30 (%) | Control group n=30 (%) | P value |
|---|---|---|
| 29/30 (96.7) | 28/30 (93.3) | 0.546 ( 95% CI) |

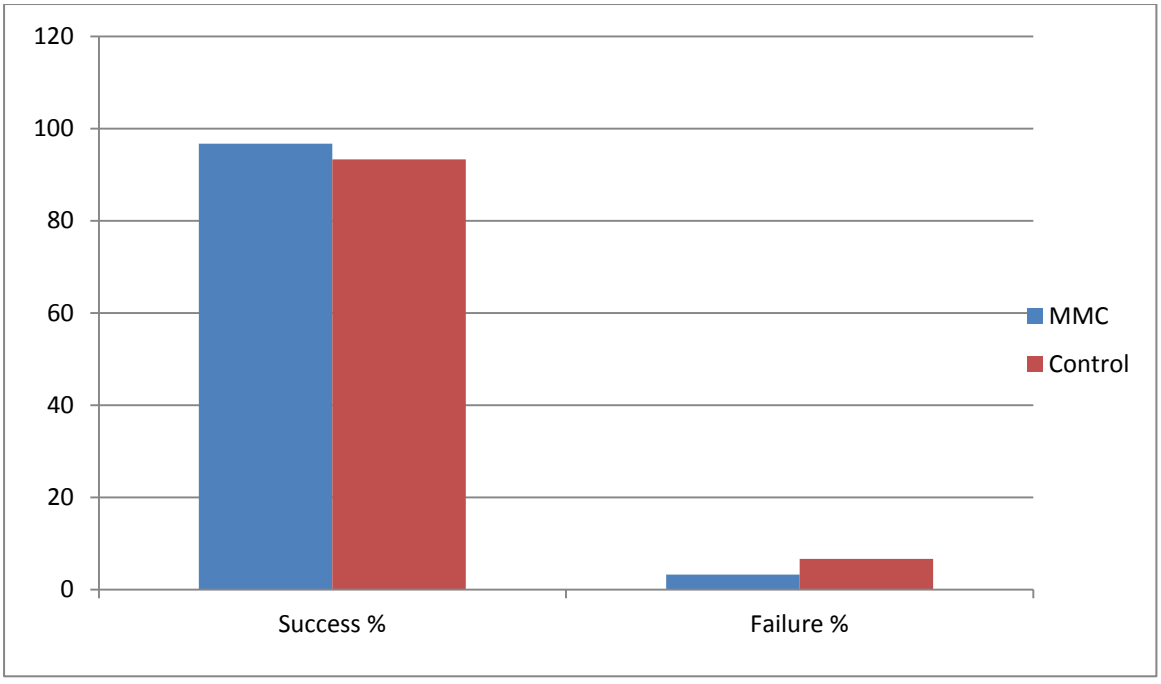



**Fig 9: Overall success rates in two groups**

**21. Correlation between Intra-operative Ostium size and Success at 3 months**

Even though all 3 patients whose DCR failed belonged to the smaller ostium group, there was found to be no statistically significant association between the ostium size and final outcome. But in the control group,the probability of higher success with larger ostia was closer to statistical significance but not significant enough to draw conclusions.(Table 24)

**Table 24: Correlation between Intra-operative Ostium size and Success at 3 months**

| **Arm** | **MMC n =26** | | **Control n= 27** | |
|---|---|---|---|---|
| **Ostium group($mm^2$)** | **<120** | **>121** | **<120** | **>121** |
| Munk 0/1 | 1/1 | 21/25 | 2/3 | 22/24 |
| Pvalue | 1.000 | | 0.119 | |
| FDDT 0/+1 | 1/1 | 20/25 | 1/3 | 22/24 |
| P value | 1.000 | | 0.049 | |
| Full/Partial Duct Patency | 1/1 | 25/25 | 2/3 | 24/24 |
| P value | 1.000 | | 0.119 | |

# DISCUSSION

External DCR has remained the gold standard for the surgical management of nasolacrimal duct obstructions ever since the current technique was introduced by Toti in the early 20th century(15).The introduction of flap suturing by Depuy-Dutemps and Bourguet in the 1920s achieved a success rate of upto 94% (1).Since then lacrimal surgeons have been trying to find out reasons for failure and improve on the results by various means.

With the advent of endoscopes, powerful lasers and drills in the 1980s, the endonasal approach has been gaining popularity and is getting closer to the success rates achieved by the conventional techniques. The success rates of Ext DCR has been reported to vary between 65-100% and that for the Endo DCR 47-94% as shown in a review of literature(32).More importantly, endoscopic evaluations of the nasal ostium in failed cases have brought to light the major reasons of the failure.

Major reasons reported for failure in DCR are scarring within the anastomosis and at the common canaliculus,closure of the ostium by granulation tissue, adhesions to the medial wall of nose, and new bone formation.

Thus logically the idea of wound modulation with antifibrotic agents came up hoping to prevent excessive fibroblast proliferation and scarring and thus improve the outcome of surgery. Mitomycin C was first used in 1980s to improve success in trabeculectomy surgeries and now it has established itself as a safe adjuvant in many other surgeries in ophthalmology(55)(57)(60).It is an alkylating agent used in cancer treatment and it inhibits DNA-dependent RNA synthesis thus reducing fibroblast collagen synthesis.

The primary aim of our study was to find out the efficacy of MMC when used intraoperatively in primary adult nasolacrimal duct obstructions.

We studied 60 cases of PANDO which was randomised to a MMC group and a Control group of 30 each.

The age distribution of our patients were more in the middle age category ie 40-70 years with a mean age of 51.4 and 50.4 years respectively in MMC and control group. This distribution was seen in other studies as well.

Our study showed a female preponderance in the incidence of PANDO with 47/60 (78.3%) patients being females. This distribution has been consistent in all previous studies(8)(9)(10)(11) proving the increased vulnerability of women to duct obstruction. It has been suggested that the smaller diameter of the inferior bony lacrimal fossa and lacrimal canal in females could contribute to this observation.

88.3% patients belonged to the low socio-economic strata and most (95%) were daily wage workers doing hose jobs or manual labour.

31/60 (51.6%) patients had a deviated nasal septum which did not cause a negative impact on the outcome of surgery. However we had excluded cases with severe DNS touching the lateral wall and with other intranasal pathologies.

**The overall success rate was 96.7% in the MMC group and 93.3% in the Control group and the difference was not statistically significant (p=0.546)**. This result was comparable with previous studies which used MMC in Ext-DCR (Table 1).They had reported success rates between 90 -100% for the MMC group and between 73-92% for the control groups. Only 4 studies could prove a statistically significant difference while the majority of studies showed no statistical significant advantage in using MMC.

The final subjective success rate at 3 months follow up was 88.5% in MMC group and 88.9% in control group which was less than the anatomical patency of 100% in MMC group and 96.3 % in controls. Rose had described this as the "Lacrimal paradox" where anatomical success may not correlate to success in control of symptoms and vice versa. There could be a hydraulic resistance to the flow of tears from the lateral canthus to the nasal cavity even with a patent passage. Previous studies have also shown similar results.(34)(35)

The average intraoperative ostium size in our study was 155 $mm^2$ and 149.8 $mm^2$ respectively in MMC and control groups. There is a general suggestion that a larger osteotomy is needed for a large anastomosis and higher success rates. Some authors have even reported 100% success rates with a osteotomy size of 400$mm^2$(38).Our study could not establish a correlation between the initial ostium size and final success though all 3 cases which failed had an initial narrower ostium(<120$mm^2$). But an important observation by Linberg that the final healed ostium size shrinked to 1.8 mm after few months of surgery with excellent functional results to the patient, questions the need of very large osteotomies increasing the risk of CSF rhinorrhoea and haemorrhage.(20)

The dose and duration of exposure of Mitomycin C is not standardised for the use in DCR. Previous studies has used doses from 0.05 -1mg /ml with exposure time varying from 2 minutes to 30 minutes (Table 1). Higher concentrations have shown to give better results as regards to final success and ostium size but the differences were not statistically significant. We used 0.4mg/ml for 5 minutes with good success outcomes.

We did a single anterior flap anastomosis technique in this study.We found this to be technically easier and less time consuming. In the posterior part of the osteotomy site, the sac and nasal mucosa are in close proximity and are likely to scar together. The advantage of posterior flap suturing causing less of healing by granulation and higher success rates was matched in this study with the single flap technique.

There were no serious adverse effects of Mitomycin C noted in our study as has been with previous studies.

# LIMITATIONS OF OUR STUDY

The major limitations of our study are the short follow up period of 3 months and limited number of participants. Most previous studies have followed the patients up from 6 months to 35 months. It has been observed that the success rate of DCR decreases as time passes on.

The skill of the surgeon is a major confounding factor with has not been addressed in this study. Most of the cases has been done by registrars who are in various stages of learning. One previous study has shown statistically significant difference in success rates between cases done by trainees and consultants. Thus detailed attention to make a large, properly positioned and uniform rhinostomy, careful dissection to expose the true lumen of the lacrimal sac, atraumatic handling of the flaps and careful suturing of mucosal flaps, are important determinants of surgical success.

# CONCLUSION

There was no statistically significant difference between the success rates of Primary External DCR with and without the use of intraoperative Mitomycin C in Primary Adult Nasolacrimal Duct Obstruction.

Mitomycin C application may not be beneficial in Primary External DCR for Primary Adult Nasolacrimal Duct Obstruction.

There was no complications related to the intraoperative use of 0.4mg/ml Mitomycin C for 5 minutes in Primary External DCR.

However, more randomized control trials involving more participants and longer follow up are required to establish the potential benefit of antimetabolites in Primary DCR surgery.

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# Appendix A-IRB Approval Letter

**INSTITUTIONAL REVIEW BOARD (IRB)**
**CHRISTIAN MEDICAL COLLEGE**
VELLORE 632 002, INDIA

**Dr. George Thomas, D Ortho**
Editor, Indian Journal of Medical Ethics
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**Dr. Nihal Thomas**
**MD MNAMS, DNB(Endo), FRACP(Endo), FRCP(Edin)**
Deputy Chairperson
Secretary, Ethics Committee, IRB
Additional Vice Principal (Research)

December 12, 2012

Dr. Vinod Joshua John
PG Registrar
Department of Ophthalmology
Christian Medical College
Vellore 632 002

Sub: **Fluid Research grant project NEW PROPOSAL**
Efficay of mitomycin C in external dacryocystohinostomy –
A randomized controlled trial.
Dr. Vinod Joshua John, PG Registrar, Schell Eye Hospital, Dr. Sarada David, Dr. Jayanthi Peter, Dr. Satheesh Solomom T Selvin, Schell Eye Hospital.

Ref: IRB Min. No. 8088 dated 21.11.2012

Dear Dr. Vinod Joshua John,

The Institutional Review Board (Silver, Research and Ethics Committee) of the Christian Medical College, Vellore, reviewed and discussed your project entitled "Efficay of mitomycin C in external dacryocystohinostomy – A randomized controlled trial." on November 21, 2012.

The Committees reviewed the following documents:

1. Format for application to IRB submission
2. Clinical Research Form
3. Munk's Score of epiphora
4. Patient Information Sheet and Informed Consent Form (English, Tamil, Telugu and Hindi)
5. Cvs of Drs. Sarada Davaid, Jayanthi Peter, Satheesh Solomon T Selvin
6. A CD containing documents 1 - 5

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Deputy Chairperson
Secretary, Ethics Committee, IRB
Additional Vice Principal (Research)


The following Institutional Review Board (Research & Ethics Committee) members were present at the meeting held on November 21, 2012 in the CREST/SACN Conference Room, Christian Medical College, Bagayam, Vellore 632002.

| Name | Qualification | Designation | Other Affiliations |
|---|---|---|---|
| Dr. Poonkuzhali | MSC, PhD | Professor, Haematology, CMC | Basic Medical Scientist |
| Dr. Biju George | MBBS, MD, DM | Professor, Haematology, CMC | Clinician |
| Dr. Suresh Devasahayam | BE, MS, PhD | Professor, Bioengineering, CMC | Professor |
| Dr. Thambu David | MBBS, MD, DNB | Professor, Medicine, CMC | Clinician |
| Dr. Deepak Abraham | MBBS, MS | Professor, Endocrine Surgery, CMC | Clinician |
| Dr. Molly Jacob | MBBS, MD, PhD | Professor, Biochemistry, CMC | Clinician |
| Dr. L. Jeyaseelan | MSc, PhD, FRSS | Professor & Head Dept. of Biostatistics & Secretary IRB (EC), CMC | Statistician |
| Dr. Anuradha Bose | MBBS, DCH, MD, MRCP, FRCPCH | Professor, Pediatrics, CMC | Clinician |
| Dr. Vinod Joseph Abraham | MBBS, MD, MPH | Professor, Community Medicine, CMC | Clinician |
| Dr. Sukriya Nayak | MBBS, MS | Professor, General Surgery, CMC | Clinician |
| Dr. Asha Mary Abraham | MBBS, MD, PhD | Professor, Virology, CMC | Clinician |



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| | | | |
|---|---|---|---|
| George Thomas | MBBS, D Ortho | Chairperson (IRB) & Orthopaedics Surgeon, St. Isabel Hospital, Chennai & Former Editor, Indian Journal of Medical Ethics | Clinician |
| Prof. Keith Gomez | BSc, MA (S.W), M. Phil (Psychiatry Social Work) | Deputy Chairperson (IRB) & Students' Counselor, Loyola College, Chennai | External, Scientist |
| Mrs. Pattabiraman | BSc, DSSA | Social Worker, Vellore | External, Social Scientist |
| Rev. Arul Dhas | MSc, BD, DPC, PhD(Edin) | Chaplain, CMC | Lay person |
| Mr. K.P. Harikrishnan | BL. | Lawyer | External, Advocate |
| Mr. Samuel Abraham | MA, PGDBA, PGDPM, M.Phil, BL. | Legal Advisor, CMC. | Internal, Advocate |
| Mr. Sampath | B.Sc, BL | Advocate, Vellore | External, Advocate |
| Dr. P. Zachariah | | Retired Professor | External, Scientist |
| Mrs. Selva Titus Chacko | MSc | Professor, Medical Surgical Nursing, CMC | Nurse |
| Dr. Nihal Thomas | MD MNAMS DNB(Endo) FRACP(Endo) FRCP(Edin) | Secretary IRB (EC)& Dy. Chairperson (IRB), Professor of Endocrinology & Addl. Vice Principal (Research), CMC. | Clinician |



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Secretary, Ethics Committee, IRB
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We approve the project to be conducted as presented.

The Institutional Ethics Committee expects to be informed about the progress of the project, any serious adverse events occurring in the course of the project, any changes in the protocol and the patient information/informed consent. And on completion of the study you are expected to submit a copy of the final report.

A sum of Rs. 40, 000 (Rupees Forty Thousand only) sanctioned for one year.

Yours sincerely

Dr. Nihal Thomas
Secretary (Ethics Committee)
Institutional Review Board

Dr Nihal Thomas
MBBS MD MNAMS DNB (Endo) FRACP(Endo) FRCP(Edin)
Secretary (Ethics Committee)
Institutional Review Board

CC: Dr. Sarada David, Department of Ophthalmology



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# Appendix B-Patient information sheet

**Christian Medical College, Vellore**

**Department of Ophthalmology**

**Efficacy of Mitomycin C in External Dacryocystorhinostomy-A Randomized control trial**

**Patient Information sheet**

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You are being requested to participate in a study to see if a drug called Mitomycin C(MMC) when used in External Dacryocystorhinostomy(DCR) operation,can improve its success rate .We hope to include about 90 people from this hospital in this study.

**What does Mitomycin C(MMC) do when used in DCR?**

The major cause for longterm failure of DCR is the scarring and contraction of an opening made in the nose to facilitate tears drainage.MMC is a drug having anti-scarring properties and is widely used in other ophthalmic surgeries with high safety profile.Thus if tried in DCR,it could reduce the longterm contraction of the nose opening thus giving a higher success rate.But this has to be proved with studies so that it can be universally accepted.

**Does MMC have any side effects?**

MMC is a chemotherapeutic agent which inhibit DNA synthesis.It is used to treat intestinal and bladder cancers. Current applications in ophthalmology include pterygium surgery, glaucoma surgery, corneal refractive surgery, cicatricial eye disease and conjunctival tumors .Local side effects include necrosis of nasal mucosa,excessive nasal bleeding,infection,inadvertent instillation into eye which can cause epithelial defects,sclera thinning,puntal occlusion and ulcer formation.But MMC is diluted and used in concentrations of 0.02-0.05% which causes the desired effect and minimal damage.Studies thus far have not shown any serious side effects in its use in DCR with one report of delayed skin wound healing and increased bleeding during surgery.

**If you take part what will you have to do?**

If you agree to participate in this study, you will be allotted into either of 2 groups.For those in Group 1,MMC will be used during DCR and for Group 2 MMC will not be used.Niether you or your doctor will have any choice or control over who goes to which group.That will be

randomly selected by the computer.Also you nor the doctor will be aware of who is in which group until the study is over.All other treatments that you are already on will be continued and your regular treatment will not be changed during this study. You will be expected to come for a review to the hospital 1 week after surgery for suture removal and irrigation of the ducts and again after 1 month and finally after 3 months.Before starting the study and at each visit syringing of the ducts and also examination for any complications will be done. No additional procedures or blood tests will be conducted routinely for this study.

If at any time you experience any problems, you will be expected to report this to the doctor. You will also be contacted by telephone at least once in between the monthly visits by the doctors in this study who will ask you about any problems you are experiencing.

**Can you withdraw from this study after it starts?**

Your participation in this study is entirely voluntary and you are also free to decide to withdraw permission to participate in this study. If you do so, this will not affect your usual treatment at this hospital in any way. In addition, if you experience any serious side effects or your condition worsens, you may be given additional treatment.

**What will happen if you develop any study related injury?**

We do not expect any injury to happen to you but if you do develop any side effects or problems due to the study, these will be treated at no cost to you. We are unable to provide any monetary compensation, however.

**Will you have to pay for the surgery?**

The drug MMC will be supplied for you free of cost but you will have to bear the whole cost of the surgery and the hospital bill.

Any other treatment that you usually take will continue but the usual arrangements that you have with the hospital will decide how much you pay for this.

**What happens after the study is over?**

You will be briefed about the results of the study and the benefits/side effects that you have had.

**Will your personal details be kept confidential?**

The results of this study will be published in a medical journal but you will not be identified by name in any publication or presentation of results. However, your medical notes may be reviewed by people associated with the study, without your additional permission, should you decide to participate in this study.

**If you have any further questions, please ask Dr.Vinod Joshua or Dr.Jayanthi Peter (tel: 0416 3071201/ 3071205) or email: drvinodjoshua@gmail.com**

# Appendix C-Informed Consent Form

**Efficacy of Mitomycin C in External Dacryocystorhinostomy-A Randomized controlled trial**

**Study Number:**

**Participant's name:**

**Date of Birth / Age (in years)**:

I_____

_____, son/daughter of _____

(Please tick boxes)

Declare that I have read the information sheet provide to me regarding this study and have clarified any doubts that I had. [ ]

I also understand that my participation in this study is entirely voluntary and that I am free to withdraw permission to continue to participate at any time without affecting my usual treatment or my legal rights [ ]

I also understand that neither I, nor my doctors, will have any choice or knowledge of whether I will receive Mitomycin C during my operation [ ]

I also understand that the Mitomycin C will be provided free but I may have to pay for the rest of the expenses [ ]

I understand that I will receive free treatment for any study related injury or adverse event but I will not receive any other financial compensation [ ]

I understand that the study staff and institutional ethics committee members will not need my permission to look at my health records even if I withdraw from the trial. I agree to this access
[ ]

I understand that my identity will not be revealed in any information released to third parties or published [ ]

I voluntarily agree to take part in this study [ ]

Name:

Signature:

Date:

Name of witness:

Relation to participant:

Date:

# Tamil Information Sheet and Consent Form

## சம்மந்த படிவம்

## சி.எம்.சி. கண் மருத்துவமனை, வேலூர்

## ஆய்வின் பெயர் : மைட்டோமைசின் - ன் - டி.சி.ஆர்

## நோயாளிகளின் தகவல் படிவம்

மைட்டாமைசின் சி என்னும் மருந்தை பயன்படுத்தி கண்களில் நீர் வடிவதை நிறுத்த செய்யும் டி.சி.ஆர் அறுவை சிகிச்சையில் ஏற்படும் முன்னேற்றத்தை அறிய உதவும் ஆய்வில் நீங்கள் பங்கேற்க உங்கள் விருப்பத்தைக் கோருகிறோம்.

இந்த மருத்துமனையில் இருந்து மொத்தம் 90 பேர் மேற்கூறிய ஆய்வில் பயன் பெற்றுள்ளனர்.

கண்ணில் நீர் வடிவதை நிறுத்த செய்யும் டி.சி.ஆர் அறுவை சிகிச்சை பெரும்பாலும் வெற்றிகரமாக அமைவதில்லை காரணம் இந்த சிகிச்சையினால் மூக்கில் ஏற்படும் வடு. ஆனால் மைட்டாமைசின் மருந்து பயன்படுத்தும்போது டி.சி.ஆர். சிகிச்சைக்கு பிறகு மூக்கிலுள்ள வடு ஏற்படுவது தவிர்க்கப்படுவதால் கண் அறுவைச் சிகிச்சையில் இது பயன்படுத்தப்படுகிறது.

மேலும் டி.சி.ஆர் சிகிச்சையின் போது மூக்கிலும் ஏற்படும் சுருக்கத்தையும் வெகுவாக குறைப்பதினால் மைட்டாமைசின் வெற்றி விகிதம் (சக்சஸ்) அதிகமாகிறது. இந்த பயன்பாடு குறித்து உண்மையில் தெரிந்துக் கொண்டு பயன்படுத்த வேண்டும் என்றால் ஆய்வுகள் மூலம் நிருபிக்பட வேண்டும்.

மைட்டாமைசின் என்பது டி.சி.ஆர். மூலக்கூறில் பினி நீக்கும் இரசாயன கலவையாகும். தற்போது கண் மருத்துவத்தில் டெரிஜியம் அறுவை சிகிச்சை, பசும்படலம் அறுவை சிகிச்சை குளோகோமா கருவிழி கதிர் சிதைவு சிகிச்சை வெண் படலத்தில் உள்ள கட்டிகளை நீக்குதல். சிகிச்சையினால் ஏற்படும் பக்க விளைவுகளில் மூக்கில் ஏற்படும் இரத்த கசிவை தடுத்தல். மற்றும் நோய் தொற்று நீக்குதல் போன்ற சிகிச்சையில் முக்கிய பங்கு வகுக்கிறது. மைட்டோமைசினில் பயன்படுத்தப்படும் திரவத்தின் செரிவு 0.02-0.05% என்ற குறைந்த அளவில் இருப்பதால் பக்க விளைவுகள் மிக குறைவு மேலும் மைட்டோமைசினில்

பயன்பாட்டினால் டி.சி.ஆர் சிகிச்சையின் போது ஏற்படும் இரத்த கசிவு மற்றும் தோல் காயம் போன்றவைகளில் மிகப்பெரிய பாதிப்பை ஏற்படுத்துவில்லை.

நீங்கள் இந்த ஆய்வில் பங்கேற்பவராக இருப்பின் 2 குழுக்களாக பிரிக்கப்படுவீர்கள். முதல் குழுவில் உள்ளவர்களுக்கு டி.சி.ஆர் சிகிச்சையில் மைட்டோமைசின் என்ற மருந்து பயன்படுத்தபடும். இரண்டாம் குழுவில் உள்ளவர்களுக்கு மைட்டோமைசின் பயன்படுத்தபடமாட்டாது. நீங்கள் எந்த குழுவில் இருக்கலாம் என்று நீங்களோ அல்லது மருத்துவரோ முடிவு செய்யலாம் கணினி மூலம் தோராயமாக தேர்வு செய்துக்கொள்ளலாம்.

நீங்கள் இந்த ஆய்வில் பங்கேற்பதால் வழக்கமான உங்களுடைய சிகிச்சையில் எந்த மாற்றமும் இருக்காது. நீங்கள் இந்த ஆய்வில் இருக்கும் போது மறுபரிசீலனைக்கு (ரீவியு) வரவேண்டும் என எதிர்பார்கிறோம். அறுவை சிகிச்சை முடிந்த முதல் வாரம் தையல் பிரிக்க வரவேண்டும். மற்றும் அந்த வேலையில் ஊசி மூலமாக தண்ணீர் செலுத்தி மூக்கினுல் வருகிறதா ? என்று சோதனை செய்யப்பட வேண்டும். இதேபோல் ஒரு மாதம் மற்றும் மூன்று மாதம் வந்து சோதனை செய்துக்கொள்ள வேண்டும். இதை தவிர்த்து வேறு எந்த சிறப்பு சோதனைகளோ, இரத்த பரிசோதனைகளோ செய்யப்படமாட்டாது.

இந்த ஆய்வின் போது உங்களுக்கு பிரச்சனைகள் மேற்கொண்டால் எந்த நேரத்திலும் மருத்துவரை அனுகலாம்.

நீங்கள் , உங்களுடைய சுய விருப்பத்தின் பேரிலேயே பங்கேற்க அழைக்கப்படுகிறீர்கள். பங்கேற்கும் பட்சத்தில் எந்த காரணமும் இன்றி விலகிக்கொள்ளவும். உங்களுக்கு உரிமை உண்டு. ஒருவேலை நீங்கள் விலகினால் உங்களுக்கு வழக்கமாக அளிக்கப்படும் சிகிச்சையில் எந்த மாற்றமும் இருக்காது. பங்கேற்கும் போது பக்கவிலைவினால் பாதிப்பு ஏற்படும்போது சிறப்பு இலவசமாக மேற்கொண்டு உங்ளுக்கு சிகிச்சை கொடுக்கப்படும்.

இந்த சிகிச்சையின் போது உங்களுக்கு மைட்டோமைசின் என்ற மருந்து மட்டுமே இலவசமாக அளிக்கப்படும் ஆனால் அறுவை சிகிச்சைக்கு உரிய பனத்தை நீங்கள் செலுத்த வேண்டும்.

இந்த ஆய்வின் முடிவுகளை மருத்துவ சம்மந்தப்பட்ட இதழ்களில் வெளியிடப்படும் ஆனால் உங்களை பற்றிய தகவல் எதுவும் தெரிவிக்கப்படமாட்டாது. மேலும் இந்த ஆய்வை குறித்த குறிப்புகளை உங்கள் அனுமதி இல்லாமல் இதற்கு தொடர்பான படிப்பை மேற்கொள்பவர்களுக்கு அளிக்கப்படும். எனவே நீங்கள் இந்த ஆய்வில் பங்கேற்க உங்கள் விருப்பத்தின் பேரில் பங்கேற்கலாம்.

குறிப்பு : இந்த ஆய்வை குறித்து மோற்கொண்டு விவரங்கள் தேவையென்றால் டாக்டர்.வினோத் ஜோசுவா (அல்லது) டாக்டர்.ஜெயந்தி ரீட்டரை அனுகவும். (தொலைபேசி எண் : 0416 - 3071201, 3071205) மின் அஞ்சல் : drvinodjoshua@gmail.com.

# இந்த ஆய்வில் பங்கேற்க சம்மதம் தெரிவிக்கும் படிவம்

## ஆய்வின் பெயர் : மைட்டோமைசின் -ன்- டி.சி.ஆர்

ஆய்வி எண் :

பங்கேற்பாளரின் பெயர் :

பிறந்த நாள் / வயது :

நான் ..... திரு()திருமதி. ..... அவர்களின் மகன் ( ) / மகள் ( ) (கட்டத்தில் டிக் செய்ய வேண்டும்)

நான் எனக்கு கொடுத்த தகவல் பிரிதுயை படித்து இந்த ஆய்வை குறித்து என்னுடைய சந்தேகங்கள் அறிந்து கொண்டேன் ( )

நான் இந்த ஆய்வில முழு மனதுடன் பங்கேற்கிறேன் என்றும் தேவை ஏற்படின் இந்த ஆய்வில் இருந்து விலகிகொள்ள எனக்கு உரிமை இருக்கிறது என்றும் அறிவேன் ( )

நானோ அல்லது மருத்துவரோ எந்த குழுவில் இருக்க வேண்டும் என்றும் அறுவை சிகிச்சையில் மைட்டோமைசின் தேவை அல்லது இல்லை என்று முடிவு செய்யலாம். ( )

மேலும் மைட்டோமைசின் மட்டும் இலவசமாக அளிக்கப்படுகிறது என்றும் மற்ற சிகிச்சைக்கு நான் முழு பணமும் செலுத்த வேண்டும் என்றும் அறிவேன். ( )

இந்த ஆய்வினால் ஏற்படும் பக்கவிளைவிற்கு இலவசமாக சிகிச்சை பெற்றுக் கொள்ளலாம் என்றும் ஆனால் சிகிச்சைக்கு பதிலாக பண உதவி பெற முடியாது என்றும் அறிந்திருக்கிறேன். ( )

இந்த ஆய்வை மேற்கொள்ளும் அலுவலர்களோ (அ) ஆய்வுக் குழு உறுப்பினர்களோ என்னுடைய அனுமதியின்றி என்னுடைய உடல்நிலை குறித்து குறிப்புகளை நான் விலகினாலும் பயன்படுத்தலாம் என்று அறிவேன். ( )

மற்ற யாருக்கும் என்னுடைய குறிப்புகளை தெரிவிக்கப்படமாட்டாது என்றும் அறிவேன். ( )

என் சுய விருப்பத்துடன் பங்கேற்கிறேன் ( )

பெயர் :

கையொப்பம் :

தேதி :

சாட்சியின் பெயர் :

பங்கேற்பவருக்கு என்ன உறவு :

தேதி :

# Hindi Information sheet and Consent form

सूचित सहमति

आप के लिए एक अध्ययन में भाग लेने के लिए देखने के लिए अगर एक दवा mitomycin सी (एमएमसी) कहा जाता है जब बाहरी Dacryocystorhinostomy आपरेशन (DCR) में इस्तेमाल किया जा रहा है, उसकी सफलता की दर में सुधार कर सकते हैं अनुरोध कर रहे हैं कि हम इस अध्ययन में इस अस्पताल से 90 के बारे में लोगों को शामिल करने की उम्मीद है.

Mitomycinसी(एमएमसी) क्या जबDCR मेंइस्तेमाल करते हैं?
DCRकेदीर्घकालिकविफलता के लिएप्रमुखकारणऔरसंकुचनएकनाकमेंऑसूसुविधाMMCविरोधीscarringगुणों वालेदवाहै और व्यापक रूपसेअन्यनेत्र सर्जरीमेंउच्च सुरक्षाकेसाथप्रयोगकरने की कोशिश कीहैखोलने कीहैDCR में,यहनाक केदीर्घकालिकसंकुचनकम हो सकता हैइस प्रकारखोलनेइस.एक उच्च सफलतादेनेकेलिएपढ़ाई के साथसाबित होइतना है कि यहसार्वभौमिकस्वीकार किया जा सकताहै.

एमएमसी किसी भी पक्ष प्रभाव है?
एमएमसी एक एजेंट जो निषेध डीएनए. आंतों और मूत्राशय के कैंसर का इलाज करने के लिए प्रयोग किया जाता है है. नेत्र विज्ञान में वर्तमान अनुप्रयोगों सर्जरी मोतियाबिंद सर्जरी, अपवर्तक सर्जरी, किणयुक्त नेत्र रोग और नेत्रश्लेष्मला ट्यूमर दुष्प्रभाव नाकके परिगलन, अत्यधिक नाक से खून बह रहा, संक्रमण, आंख में अनजाने टपकाना जो उपकला दोष पैदा कर सकते हैं, श्वेतपटल रोड़ा और अल्सर. एमएमसी पतला और 0.02-0.05% है जो इस प्रकार अब तक वांछित प्रभाव और न्यूनतम. DCR में इसके उपयोग में किसी भी गंभीर साइड इफेक्ट देरी त्वचा घाव भरने की एक रिपोर्ट के साथ नहीं दिखाया गया है का कारण बनता है की सांद्रता में इस्तेमाल किया है खून बह रहा है और शल्य चिकित्सा के दौरान वृद्धि हुई है

अगर तुम भाग लेने के लिए आप क्या करना होगा?
यदि आप इस अध्ययन में भाग लेने के लिए सहमत हैं, तो आप 2. समूह 1 में उन दोनों में आवंटित किया जाएगा, एमएमसी DCR दौरान और समूह 2 एमएमसी के लिए इस्तेमाल किया जाएगा. नहीं होगा या अपने चिकित्सक से किसी भी विकल्प होगा या पर नियंत्रण के लिए जो करने के लिए चला जाता है.अनियमित. द्वारा चयन किया जाएगा आप और न ही चिकित्सक जो जो समूह में है के बारे में पता हो सकता है जब तक अध्ययन.अन्य उपचार है कि आप पर पहले से ही कर रहे हैं के लिए जारी किया जाएगा और इस अध्ययन के दौरान अपने नियमित उपचार परिवर्तित नहीं किया जाएगा. आप सीवन को हटाने और नलिकाओं की सिंचाई और फिर इसके बाद 1 महीने के लिए शल्य चिकित्सा के बाद अस्पताल 1 सप्ताह के लिए एक समीक्षा के लिए आने की उम्मीद जाएगा और अंत में 3अध्ययन शुरू करने के बाद और प्रत्येक यात्रा पर नलिकाओं का और भी परीक्षा के लिए

किसी भी जटिलताओं किया जाएगा. कोई अतिरिक्त प्रक्रियाओं या रक्त परीक्षण इस अध्ययन के लिए नियमित रूप से आयोजित किया जाएगा.

किसी भी समय आप किसी भी समस्याओं का अनुभव करते हैं, तो आप डॉक्टर के पास इस रिपोर्ट की उम्मीद होगी. तुम भी टेलीफोन द्वारा संपर्क किया जाएगा जो आप किसी भी समस्याओं का सामना कर रहे हैं आप के बारे में पूछना होगा इस अध्ययन में डॉक्टरों द्वारा मासिक दौरे के बीच में कम से कम एक बार.

आप इस अध्ययन से वापस लेने के बाद यह शुरू होता है?

इस अध्ययन में आपकी भागीदारी पूरी तरह स्वेच्छिक है और आप भी करने के लिए इस अध्ययन में भाग लेने की अनुमति वापस लेने का फैसला करने के लिए स्वतंत्र हैं. यदि आप ऐसा करते हैं, यह किसी भी तरह से इस अस्पताल में सामान्य उपचार को प्रभावित नहीं करेगा. इसके अलावा, अगर आप किसी भी गंभीर साइड इफेक्ट या अपनी हालत बिगड़ का अनुभव करते हैं, तो आप अतिरिक्त उपचार दिया जा सकता है.

अगर आप किसी भी अध्ययन से संबंधित चोट का विकास क्या होगा?

हम आप के लिए किसी भी चोट होने की उम्मीद नहीं है, लेकिन अगर आप किसी भी पक्ष प्रभाव या समस्याओं का अध्ययन करने के लिए कारण विकसित करते हैं, ये आप के लिए कोई भी कीमत पर इलाज किया जाएगा. हम किसी भी मौद्रिक मुआवजा प्रदान करने में असमर्थ हैं, लेकिन.

आप के लिए शल्य चिकित्सा के लिए भुगतान करना होगा?

दवा एमएमसी आप मुफ्त के लिए आपूर्ति की जाएगी, लेकिन आप सर्जरी और अस्पताल के बिल की पूरी लागत को वहन करना होगा.

किसी भी अन्य उपचार है कि आप आमतौर पर ले जारी रख सकते हैं, लेकिन सामान्य व्यवस्था है कि आप अस्पताल के साथ तय होगा कि आप कितना इस के लिए भुगतान करेगा.

अध्ययन के बाद खत्म हो गया है क्या होता है?

आप अध्ययन के परिणाम और लाभ / दुष्प्रभाव है कि आप पड़ा है के बारे में बताया जाएगा.

आपकी व्यक्तिगत जानकारी को गोपनीय रखा जाएगा?

इस अध्ययन के परिणामों को एक मेडिकल जर्नल में प्रकाशित किया जाएगा, लेकिन आप नाम से किसी भी प्रकाशन या परिणामों की प्रस्तुति में नहीं पहचाना जाएगा. हालांकि, अध्ययन से जुड़े लोगों द्वारा अपने मेडिकल नोट्स समीक्षा की जा सकता है अपने अतिरिक्त अनुमति के बिना, आप इस अध्ययन में भाग लेने का फैसला करना चाहिए.

या ईमेल: drvinodjoshua@gmail.com: यदि आप किसी भी आगे के प्रश्नहैं,कृपयापूछना Dr.Vinod योशुया Dr.Jayanthiपीटर(0416 /3,071,2053,071,201दूरभाष)

अध्ययन शीर्षक:

बाहरी DacryocystorhinostomyएकRandomisedनियंत्रितपरीक्षणMitomicinसीमेंप्रभावकारिता

अध्ययन संख्या:
प्रतिभागी कानाम:
जन्म / Ageकी तारीख(वर्षों में):

I_____
_____बेटा/बेटी_____
(कृपया टिक बक्से)
एलान कि मैंने पढ़ा हैमुझेइस अध्ययनकेबारेमेंजानकारी पत्रकप्रदान करने औरकिसीभीसंदेहहै कि मैं थास्पष्टहै. []
मैं यहभीसमझते हैं किइस अध्ययन मेंमेरीभागीदारीपूरीतरहस्वैच्छिकहैऔरमुझेमेरेसामान्य उपचारयाअपने कानूनीअधिकारोंको प्रभावित किए बिनाकरने के लिएकिसीभीसमय मैंभाग लेने के लिए जारीकरनेकीअनुमतिकोवापसलेनेकेलिएस्वतंत्रहै कि[]
मैं भी समझता हूँ कि न तो मैंऔरनहीमेरेडॉक्टरों किसी भी या
किक्यामैंअपनेआपरेशनकेदौरानmitomycinसीप्राप्त होगापसंद्नान होगा[]
मे यह भी समझता हैकिmitomycinसी: शुल्कप्रदान किया जाएगालेकिनमेंखर्चके
बाकी[]केलिएभुगतानकरनेकेलिएहो सकता है
मैं समझता हूँ कि मैंकिसीभीअध्ययन से संबंधित चोटयाप्रतिकूल घटनाकेलिएनि: शुल्कउपचार प्राप्त होगा,लेकिनमैंकिसी भी अन्य वित्तीयमुआवजा[]नहींप्राप्त होगा
मैं समझता हूँ किअध्ययन कर्मचारियोंऔरसंस्थागतनैतिकतासमिति के सदस्यों कोमेरी अनुमतिकी जरूरत नहीं हैमेरेस्वास्थ्य रिकॉर्डकोदेखनेभी अगर मैंपरीक्षण सेहटजाएगा. मैंइस का उपयोगकरने के लिए सहमत[]
मैं समझता हूँ कि मेरी पहचानकिसी तीसरे पक्ष कोजारी याप्रकाशितजानकारीमेंखुलासा नहीं किया जाएगा]
मैं स्वेच्छा सेइस अध्ययन मेंभाग लेने के] [करने केलिएसहमत

नाम:
हस्ताक्षर:
तिथि:
गवाह का नाम:
भागीदार के संबंध:

# Telugu Information sheet and Consent Form

## అ రండోమిజేడ్ ట్రయల్ కంపరింగ్ ఎక్సర్సల్ దక్రో సైస్టోర్తినోస్తోమి విత్ అద్జివంట్ మితోమ్యిస్స్ c అండ్ కంట్రోల్స్ వితౌట్ మితోమ్యిస్స్ c

దక్రోసైస్తో ర్థినోస్తోమి అనే శస్త్ర చికిస్త లో మితోమ్యిస్స్ c అనే మందు వాడడం వల్ల దాని ఫలితం ఎలా మేగురుపడుతుంది అని చూడడానికి చేసే అధ్యాయం లో మిమల్ని పాలుపంచుకోమని అడుగుతున్నాను.

దీనిలో నేను 55 మంది ని చేర్చుకుంటున్నాను.

- మితోమిసిన్ C DCR అనే శస్త్ర చికిత్స లో ఎలా పని చేస్తుంది ?

కంటి లోంచి ముక్కుకి ఒక నాళం లాంటి దారి వుంటుంది. అది DCR ఆపరేషన్ చేసిన తరువాత దారి పూడుకు పోయే అవకాసం వుంది .ఒక వేళ దేనిలో మితోమ్యిస్స్ C అనే మందు వాడినట్లు అయితే DCR యొక్క ఫలితం మెరుగు పడే అవకాశం వుంది .దీని కోసం నేను ఈ ట్రయల్ చేస్తున్నాను

- మితమ్యిస్స్ C వలన వచ్చే సైడ్ ఈఫ్ఫెక్ట్స్ ?

మితోమ్యిస్స్ c DNA , RNA మరియు కన విభిజనను నిలిపివేస్తుంది . ఈ మందు ను సామాన్యంగా గర్భ నాళాలో , ముత్ర నాళ వచ్చే కాన్సర్ జబ్బుకు వాడుతారు .

కంటికి సంభందించిన ప్తెర్యియం , నీటి కాసు , కను పాప సంబంధించిన జబ్బులో వాడుతారు.

దీని వల్ల ముక్కులోంచి రక్తం కారడం , చీముపట్టడం మరియు కంట్లో ఒకవేల దీన్ని వాడుతే కను పాప దెబ్బ తినడం , పుండు కావటం జరగవచ్చు .

- ఈ స్టడీ లో పలు పంచుకోవడానికి ఇష్టపడితే మేము ఏమి చేయాలి ?

మీరు ఈ స్టడీ లో పలు పంచుకోవడానికి ఇష్టపడితే మిమ్మల్ని రెండు గ్రూపులుగా విభజిస్తము. ఒక గ్రూపుకు MMC వాడుతాము ఇంకొక గ్రూపుకు మంక్ వాదము . మిమ్మల్ని పరీక్షించే డాక్టర్ కు కానీ మీకు కానీ మీరు ఈ గ్రూపు లో ఉనారు అన్నది తెలియదు.

మీరు ఈ స్టడీ లో వున్నపుడు మీరు రోజు వాడే మందుల్ని ఎప్పటి లాగానే వాడచ్చు.

మీరు శస్త్ర చికిస్త తరువాత మొదటి వారం , మొదటి నెల , మూడు నెలల తరువాత , చివరిగా ఆరు నెలల తరువాత రావాల్సి వుంటుంది . మూడు నెలల తరువాత , ఆరు నెలల తరువాత మీ ముక్కులో నాళం ఉచితం గా పరీక్షిస్తారు

మీరు వచ్చిన ప్రతి సారి నీరు కారటం ఎంత తగ్గింది మరియు కంటికి ముక్కుకి వున్నా నాళం ఎలా వుంది పరిక్షిస్తం . మీకు ఎమన్నా ఇభందులు వుంటే మీరు ఎప్పుడన్నా డాక్టర్ గారికి ఫోన్ చేసి మీ ఇభంది విరరించ వచ్చు

- నేను ఈ స్టడీ నుంచి విరమించుకోవచ్చ ?

మీరు ఈ స్టడీ లోనుంచి ఎప్పుడన్నా విరమించు కోవచ్చు. మీ మీద ఎటువంటి వతిడి ఉండదు . మీరు విరమించుల్కున్న మీకు చికిస్త పరంగా ఎలాంటి నష్టం జరగదు .మీకు అనుకోని సంఘటనలు జరిగితే ఈ ఆసుపత్రి లో దానికి సంబంధించిన పరిక్షలు, చికిస్త ఉచితం గా చేయబడును .

- నాకు ఈ చికిస్త వల్ల అనుకోని సంగటనలు జరిగితే ?

ఈ శస్త్ర శికిస్త వల్ల సాదారణంగా ఎటువంటి చెడు సంగటనలు జరగవు , ఒకవేల జరిగినచో జరిగితే ఈ ఆసుపత్రి లో దానికి సంబంధించిన పరిక్షలు , చికిస్త ఉచితం గా చేయబడును .

- మేము ఈ శాస్త చికిస్త కు డబ్బు కట్టల ?

MMC మందు మీకు ఉచితం గా వాడపడుతుంది శస్త్ర చికిత్స కు అయ్యే కర్చు మీరు పెట్టుకోవాలి.

- స్టడీ అయిన తరువాత ఏమి జరుగుతుంది ? మా పేర్లు గుప్తంగా ఉంచ పడుతాయ ?

దీని ఫలితాన్ని మీకు వివరిస్తము . ఈ ఫలితాలని జోర్నల్స్ లో ప్రచురిస్తము కానీ మీ పేర్లు కానీ మీ వివరాలు కానీ ఎక్కడ ప్రచురించము. మీ ఫలితాలని మాత్రంమే వాడుతాము

మీకు ఏమన్నా ప్రశ్నలు వుంటే Dr.Vinod Joshua or Dr.Jeyanthi Peter (tel: 0416 3071201/ 3071205) or email: drvinodjoshua@gmail నిసంకోచంగా అడగ వచ్చు

## అ రండోమిజేడ్ ట్రయల్ కంపరింగ్ ఎక్సర్నల్ దక్రో

## సైస్టోర్తినోస్తోమి విత్ అధివంట్ మితోమ్మ్యిస్ c అండ్ కంట్రోల్స్ విథౌట్ మితోమ్మ్యిస్ c

స్టడీ అంకె .....

మీ పేరు .....

పుట్టిన తేది / వయసు ( సంవత్సరాలలో ).....

తండ్రి / తల్లి పేరు.....

సరైన డబ్బా జవాబు ఇవ్వండి

నేను మీరు ఇచిన ఈ స్టుడి గురించిన అన్ని వివరాలు చదివాను [ ]

నేను మన్స్పూతిగా ఈ స్టడీ లో పలు పంచుకుంటున్నాను , నేను ఎప్పుడు కావాలంటే అప్పుడు ఈ స్తుడ్డి లోంచి బయటకి వెళ్లిపోవచ్చు అని నాకు తెలుసు [ ]

డాక్టర్ కి కానీ నాకు కానీ మితోమ్మ్యిస్ C నాకు చేసిన శస్త్ర చికిత్స లో వాడార లేదా అన్నది తెలియదు [ ]

నాకు మితోమ్మ్యిస్ C మాత్రమే ఉచితంగా ఇవ్వ బడుతుంది అని తెలుసు . శస్త్ర చికిత్స కి అయ్యే ఖర్చు నేను పెట్టుకోవాలి అని తెలుసు [ ]

నాకు ఈ శస్త్ర చికిత్స వాళ్ళ ఎమ్మన అనుకోని సంఘటనలు జరిగితే నాకు వైద్యం ఉచితంగా ఇవ్వ బడుతుంది అని తెలుసు కానీ నీకు డబ్బు రూపం లో ఎటువంటి నష్ట పారిహారం ఇవ్వబడదు అని తెలుసు [ ]

నా కేసు రికార్డ్స్ చూడడానికి నా సమ్మతం తో అవసరం లేదు అని నాకు తెలుసు [ ]

నా పేరు ఇతర వివరాలు వేరే ఎవ్వారికి ఇవ్వరు అని నాకు తెలుసు [ ]

నా అంతట నేను ఈ స్టడీ లో మనస్ఫూర్తి గా పలుపంచుకుంటున్నాను [ ]

పేరు

సంతకం

తేది

సాక్షి పేరు

సంతకం

తేది

# Appendix D-Clinical Research Form

| | |
|---|---|
| **Study no** | |
| **Study Group** | **MMC / Control** |
| **Date of Enrollment** | |

| | |
|---|---|
| **Name** | |
| **Age** | |
| **Sex** | **Male / Female** |
| **Occupation** | |
| **Hospital No** | |
| **Address** | |
| **Socio Economic Status** | **Low/ Middle / High** |
| **Contact No** | |

| | |
|---|---|
| **Any co-morbidities-**<br><br>**DM/HT/Keloid tendencies/Immunosupressive states/Bleeding tendencies/Others** | |
| **Anterior Rhinoscopy** | |
| **Pre op Epiphora Score** | |

| | |
|---|---|
| **Pre op Fluorescein Dye Disappearance Test** | **Normal / Inadequate; Score-** |
| **Pre op-Syringing** | **Blocked / Partially free** |

| | |
|---|---|
| **Date of DCR** | |
| **Surgeon** | **Registrar / Consultant** |
| **IntraOp Ostium size (AP x Vertical mm$^2$)** | **____mm X ____mm** |
| **Duration of DCR in mins** | |
| **IntraOp complications** | **Lost flap /Torn flap /Nil**<br><br>**Bleeding –Severe /WNL** |

| | |
|---|---|
| **Date of Suture removal** | |
| **1 week Post op -Date** | |
| **Epiphora Score** | |
| **Fluorescein Dye Disappearance Test** | **Normal / Inadequate ; Score-** |
| **Syringing** | **Patent/Blocked** |

| | |
|---|---|
| **1 month Post op-Date** | |
| **Epiphora score** | |
| **Fluorescein Dye Disappearance Test** | **Normal / Inadequate; Score-** |
| **Syringing** | **Patent/Blocked** |

| | |
|---|---|
| **3 months Post op Date** | |
| **Epiphora score** | |
| **Fluorescein Dye Disappearance Test** | **Normal / Inadequate;Score-** |
| **Syringing** | **Patent / Blocked** |

| | |
|---|---|
| **Any Post Op Complications/Comments** | |

# Appendix E-CTRI Registration

CLINICAL TRIALS REGISTRY - INDIA
NATIONAL INSTITUTE OF MEDICAL STATISTICS
INDIAN COUNCIL OF MEDICAL RESEARCH

REF/2013/01/004471
CTRI Website URL - http://ctri.nic.in

**Clinical Trial Details (PDF Generation Date :- Wed, 06 Feb 2013 14:09:27 GMT)**

| | |
|---|---|
| **CTRI Number** | CTRI/2013/02/003352 [Registered on: 06/02/2013] - **Trial Registered Prospectively** |
| **Last Modified On** | 04/02/2013 |
| **Post Graduate Thesis** | Yes |
| **Type of Trial** | Interventional |
| **Type of Study** | Drug |
| **Study Design** | Randomized, Parallel Group, Placebo Controlled Trial |
| **Public Title of Study** | Effect of a drug Mitomycin C in repair of tear ducts |
| **Scientific Title of Study** | Efficacy of Mitomycin C in External Dacryocystorhinostomy-A Randomized controlled trial |

**Secondary IDs if Any**

| Secondary ID | Identifier |
|---|---|
| NIL | NIL |

**Details of Principal Investigator or overall Trial Coordinator (multi-center study)**

| Details of Principal Investigator | |
|---|---|
| **Name** | VINOD JOSHUA JOHN |
| **Designation** | PG student |
| **Affiliation** | Christian Medical College |
| **Address** | Department of Ophthalmology Schell campus,Arni road Vellore dist Tamil Nadu Pin-632001 Department of Ophthalmology Schell campus,Arni road Vellore dist Tamil Nadu Pin-632001<br>Vellore<br>TAMIL NADU<br>632001<br>India |
| **Phone** | 04163071201 |
| **Fax** | |
| **Email** | drvinodjoshua@gmail.com |

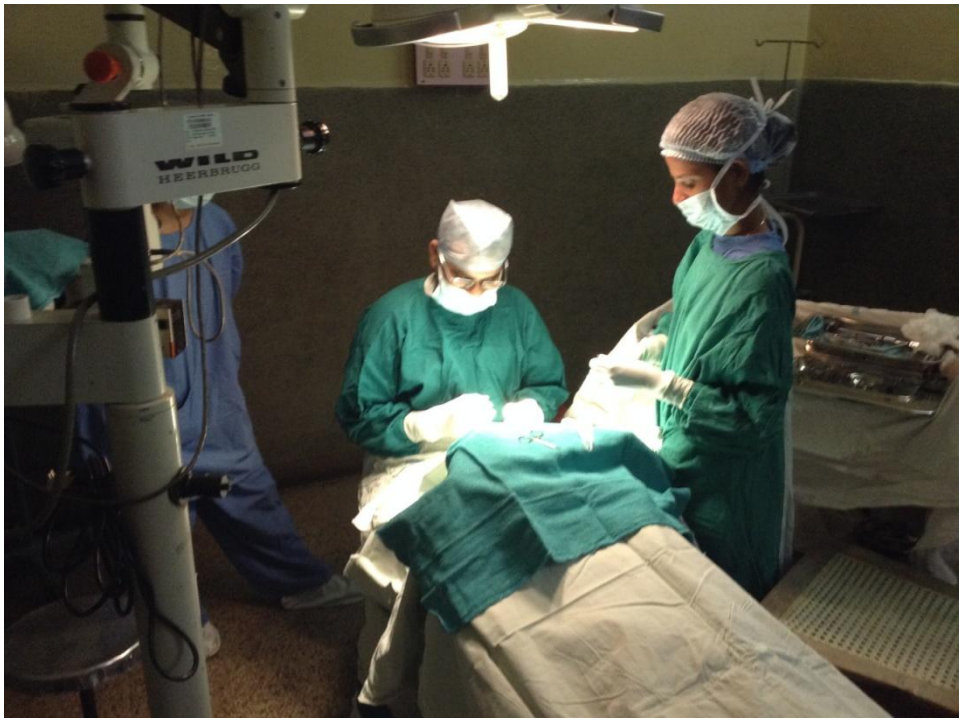
**Details Contact Person (Scientific Query)**

| Details Contact Person (Scientific Query) | |
|---|---|
| **Name** | Sarada David |
| **Designation** | Professor |
| **Affiliation** | Christian Medical College |
| **Address** | Department of Ophthalmology Schell campus,Arni road Vellore dist Tamil Nadu Pin-632001 Department of Ophthalmology Schell campus,Arni road Vellore dist Tamil Nadu Pin-632001<br>Vellore<br>TAMIL NADU<br>632001<br>India |
| **Phone** | 04163071201 |
| **Fax** | |
| **Email** | saradadavid@gmail.com |

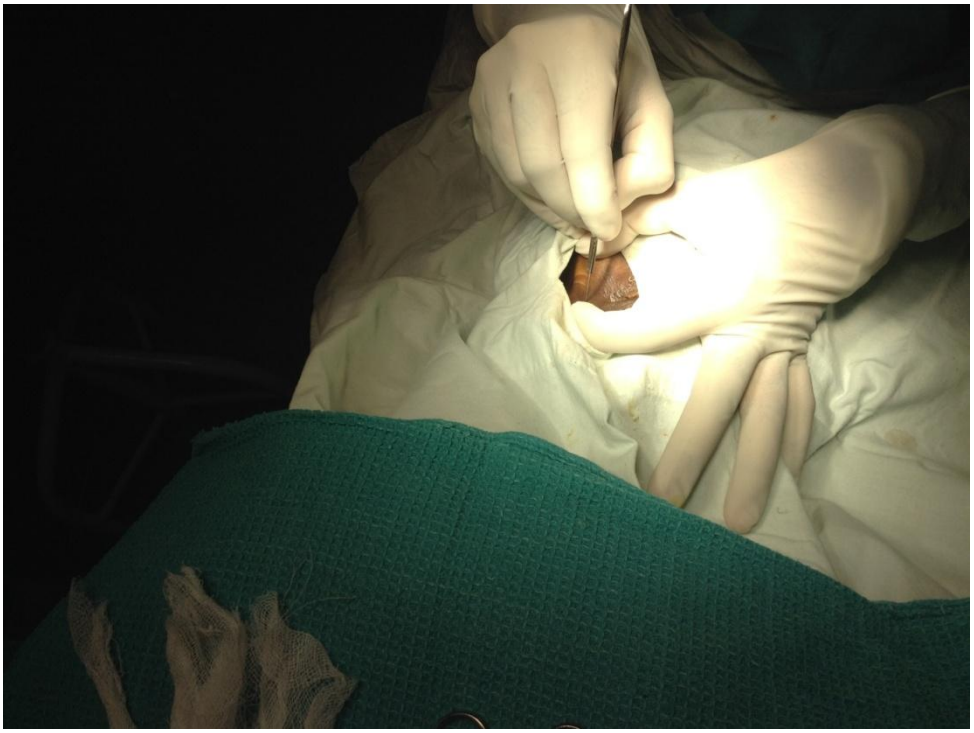
**Details Contact Person (Public Query)**

| Details Contact Person (Public Query) | |
|---|---|
| **Name** | VINOD JOSHUA JOHN |
| **Designation** | PG student |
| **Affiliation** | Christian Medical College |
| **Address** | Department of Ophthalmology Schell campus,Arni road Vellore dist Tamil Nadu Pin-632001 Department of Ophthalmology Schell campus,Arni road Vellore dist Tamil Nadu Pin-632001<br><br>TAMIL NADU<br>632001 |

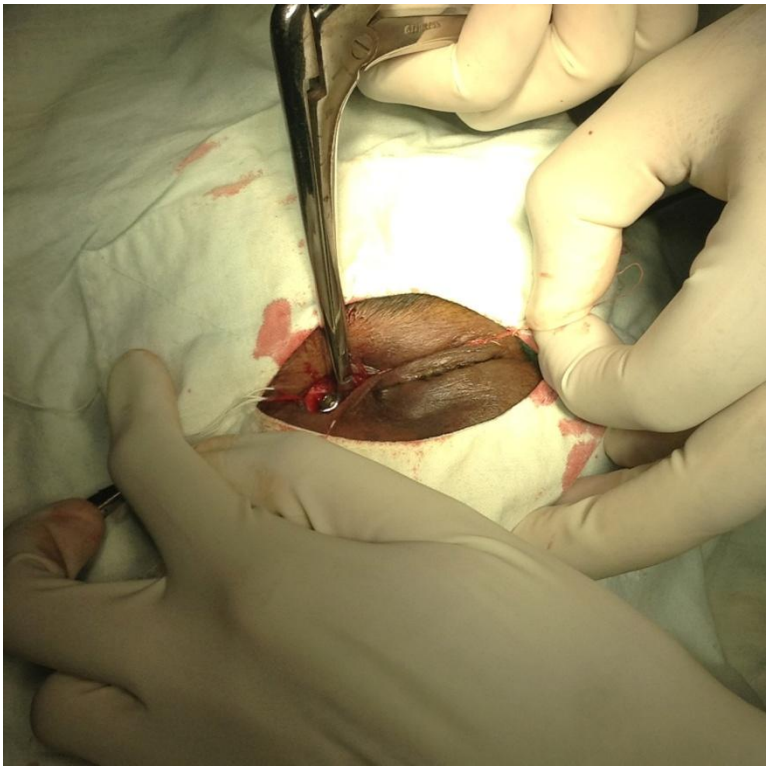
# Appendix F –Colour plates



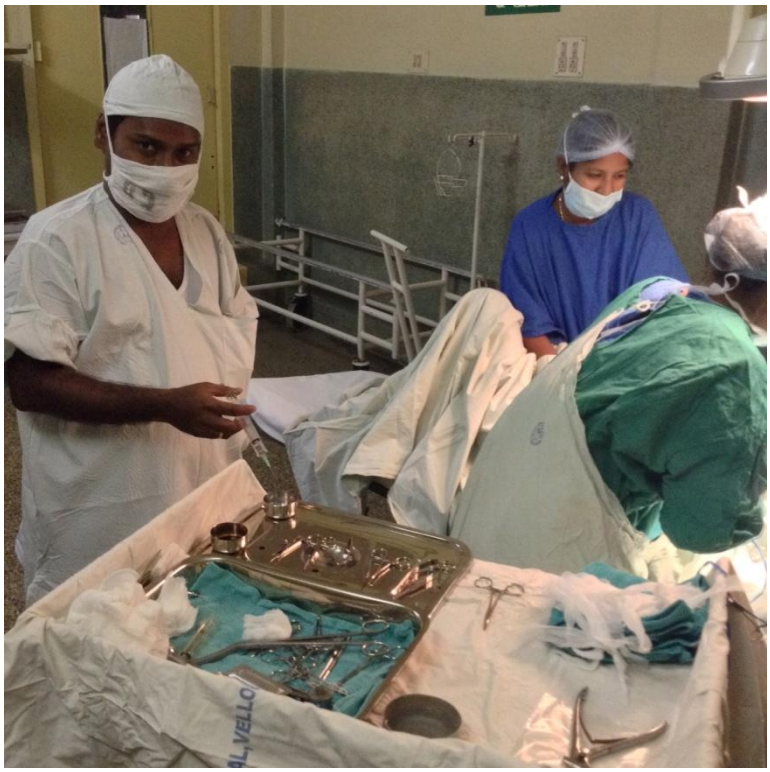

**Picture 1: Septic OT**



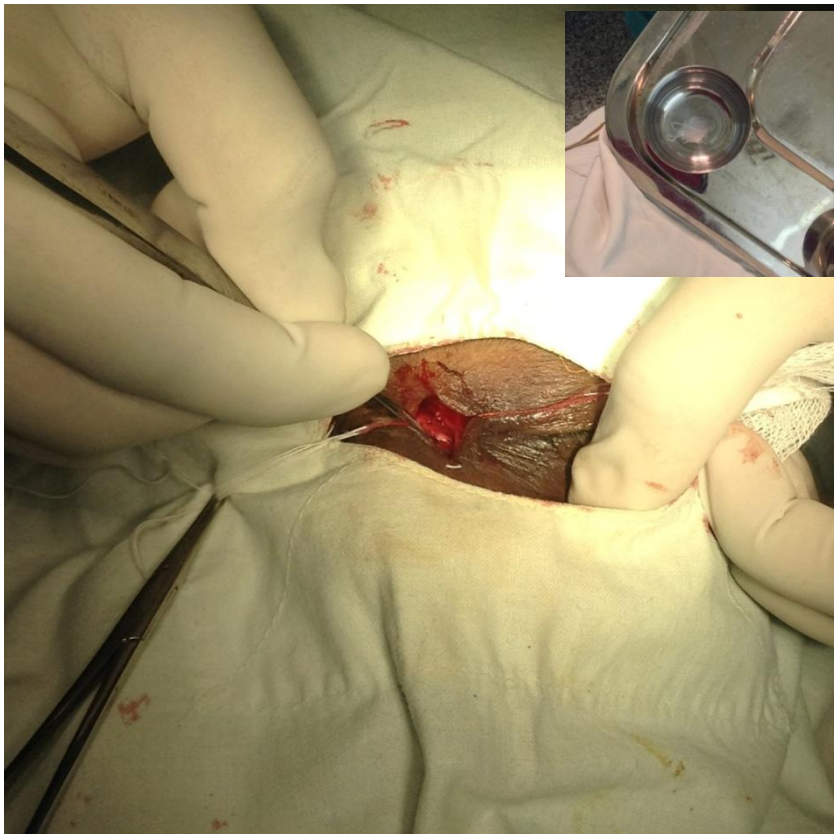
**Picture 2: Skin incision**



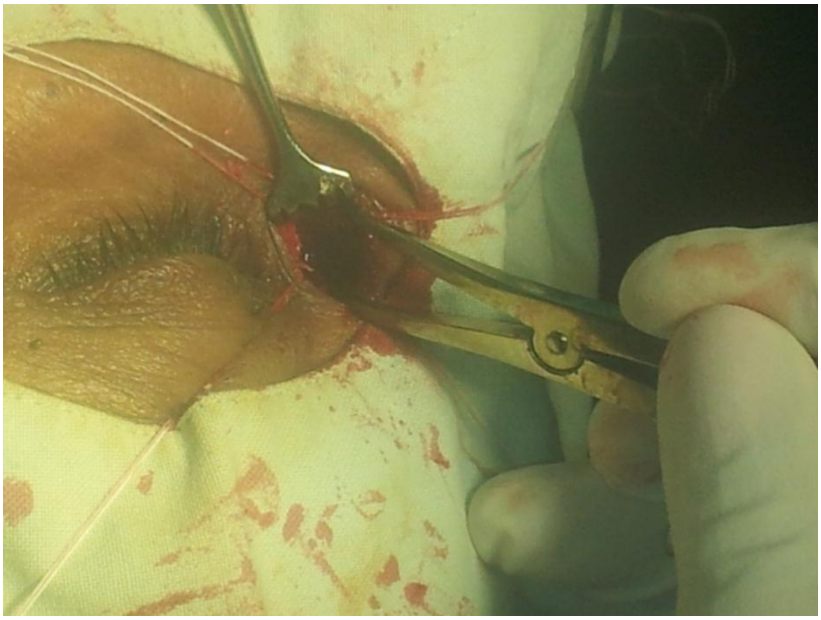
**Picture 3: Creating the osteotomy with bone punch**



**Picture 4:Blinded allocation of the test solution**



**Picture 5: Placing the cottonoid soaked in test solution**



**Picture 6: Measurement of Ostium size**

# Appendix G-Data sheet

**Legend**

Arm: MMC=1 Control= 0

Age group:18-30 =1;31-40=2;41-50=3;51-60=4;61-70=5;71-80=6;>80=7

Sex:Male=1;Female=0

Occupation:House job=1;Manual labour=2;Bussiness=3;Retd=4

Co-morbidity: Nil=0;DM=1;HTN=2;IHD=3;CVA=4;Others=5

Anterior Rhinoscopy:Normal=0;DNS=1;DNS with spur=2;Allergic Rhinitis=3;Others= 4

Surgeon:Consultant=1;Registrar =2

Osteum group:<120 =0;>121=1

OP complications:Nil=0;Excess bleed=1;Lost flap=2;Incomplete flap=3

Suture removal:5-10 days=1;>10days =2

Follow up:Completed =1;Lost=0

Post Op complications:Nil=0;Delayed wound healing=1;Wound infection=2;Failure=3;Excessive nasal bleed=4;Others=5

| No | Date | Name | Arm | Age | Age grp | Sex | Occupation | Address | SES | Co-Morbidities 1 | Co-Morbidities 2 | AR | Pre-Munk | Pre FDDT | Pre Ducts | Surgeon | Osteum in mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24/10/2012 | Kanniammal | 0 | 45 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 1 | 156 |
| 2 | 16/11/2012 | Devaki | 1 | 60 | 4 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 121 |
| 3 | 29/11/2012 | Manickam | 0 | 70 | 5 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 4 | 4 | 1 | 2 | 144 |
| 4 | 29/11/2012 | Kokila | 1 | 34 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 3 | 1 | 1 | 110 |
| 5 | 05/12/2012 | Sarojamma | 0 | 62 | 5 | 0 | 1 | 2 | 2 | 0 | 0 | 1 | 3 | 4 | 1 | 2 | 121 |
| 6 | 06/12/2012 | Lakshmiakka | 1 | 40 | 2 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 132 |
| 7 | 12/12/2012 | Chitra | 0 | 29 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 169 |
| 8 | 12/12/2012 | Rajendran | 1 | 52 | 4 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 3 | 3 | 1 | 2 | 121 |
| 9 | 26/12/2012 | Rukumani | 1 | 58 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 225 |
| 10 | 02/01/2013 | Poongodi | 0 | 61 | 5 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 120 |
| 11 | 02/01/2013 | Shafiula | 1 | 64 | 5 | 1 | 4 | 1 | 2 | 1 | 2 | 1 | 5 | 4 | 1 | 2 | 156 |
| 12 | 16/01/2013 | Selvamani | 1 | 60 | 4 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 13 | 22/01/2013 | Barani | 0 | 30 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 169 |
| 14 | 23/01/2013 | Aslam Basha | 1 | 39 | 2 | 1 | 3 | 1 | 2 | 0 | 0 | 2 | 4 | 4 | 1 | 2 | 143 |
| 15 | 05/02/2013 | Shanthi | 0 | 45 | 3 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 100 |
| 16 | 11/02/2013 | Sarala | 1 | 42 | 3 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 81 |
| 17 | 12/02/2013 | Krishnaveni | 0 | 71 | 6 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 100 |
| 18 | 20/02/2013 | Jayammal | 1 | 61 | 5 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 5 | 4 | 1 | 2 | 169 |
| 19 | 26/02/2013 | Shantha | 0 | 60 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 225 |
| 20 | 27/02/2013 | Murugesan | 0 | 37 | 2 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 21 | 27/02/2013 | Shamshune | 1 | 41 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 22 | 27/02/2013 | Kasthuri | 0 | 64 | 5 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 5 | 3 | 1 | 2 | 156 |
| 23 | 06/03/2013 | Suseela | 1 | 45 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 169 |
| 24 | 04/04/2013 | Krishnammal | 1 | 66 | 5 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 25 | 04/04/2013 | Krishnaveni | 0 | 55 | 4 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 169 |
| 26 | 11/04/2013 | Sheela | 1 | 37 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 27 | 18/04/2013 | Babu | 0 | 40 | 2 | 1 | 2 | 2 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 169 |
| 28 | 18/04/2013 | Basheera Bee | 1 | 75 | 6 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 5 | 4 | 1 | 2 | 169 |
| 29 | 18/04/2013 | Rathinam | 1 | 61 | 5 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 30 | 25/04/2013 | Lakshmi | 0 | 85 | 7 | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 5 | 4 | 1 | 2 | 156 |

| No | Date | Name | Arm | Age | Age grp | Sex | Occupation | Address | SES | Co-Morbidities 1 | Co-Morbidities 2 | AR | Pre-Munk | Pre FDDT | Pre Ducts | Surgeon | Osteum in mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 25/04/2013 | Menaka | 0 | 49 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 32 | 25/04/2013 | Panchatsaram | 0 | 64 | 5 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 130 |
| 33 | 25/04/2013 | Baby | 0 | 51 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 34 | 09/05/2013 | Krishnammal | 1 | 66 | 5 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 169 |
| 35 | 09/05/2013 | Saraswati | 1 | 56 | 4 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | 5 | 4 | 1 | 2 | 182 |
| 36 | 09/05/2013 | Datchayani | 1 | 31 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 169 |
| 37 | 15/05/2013 | Jamuna | 0 | 30 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 38 | 16/05/2013 | Jayamary | 0 | 69 | 5 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 169 |
| 39 | 16/05/2013 | Shanma | 1 | 25 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 40 | 16/05/2013 | Basheera Bee | 1 | 75 | 6 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 5 | 4 | 1 | 2 | 156 |
| 41 | 22/05/2013 | Vasantha | 1 | 28 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 5 | 4 | 1 | 1 | 169 |
| 42 | 23/05/2013 | Kirubai | 0 | 52 | 4 | 0 | 1 | 1 | 2 | 0 | 0 | 1 | 2 | 2 | 1 | 2 | 182 |
| 43 | 27/05/2013 | Venda | 0 | 47 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 100 |
| 44 | 29/05/2013 | Amarnath | 1 | 30 | 1 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 45 | 30/05/2013 | Malliga | 1 | 50 | 3 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 169 |
| 46 | 03/06/2013 | Dakshinamoorthy | 0 | 61 | 5 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 110 |
| 47 | 06/06/2013 | Visalatchi | 0 | 53 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 48 | 06/06/2013 | Govinda Singh | 0 | 43 | 3 | 1 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 121 |
| 49 | 06/06/2013 | Baby | 0 | 50 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 50 | 13/06/2013 | Mageshwari | 1 | 40 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 169 |
| 51 | 17/06/2013 | Banumathy | 1 | 60 | 4 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 1 | 156 |
| 52 | 20/06/2013 | Laxmi | 0 | 32 | 2 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 53 | 27/06/2013 | Razia Begum | 0 | 46 | 3 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 54 | 27/06/2013 | Chinnammal | 1 | 56 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 55 | 27/06/2013 | Ramamoorthy | 1 | 60 | 4 | 1 | 2 | 1 | 1 | 1 | 2 | 0 | 5 | 4 | 1 | 2 | 156 |
| 56 | 04/07/2013 | Fathima Bee | 1 | 78 | 6 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 57 | 04/07/2013 | Sujatha | 0 | 36 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 58 | 04/07/2013 | Kasi | 0 | 54 | 4 | 1 | 3 | 2 | 2 | 0 | 0 | 0 | 5 | 4 | 1 | 2 | 156 |
| 59 | 23/07/2013 | Gnanavel | 1 | 22 | 1 | 1 | 2 | 2 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 156 |
| 60 | 25/07/2013 | Chinnathai | 0 | 52 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 | 4 | 1 | 2 | 169 |

| No | Date | Name | Osteum Group | OP complication 1 | OP compli 2 | S/R | 1 wk Munk | 1 wk FDDT | 1 wk Ducts | 1mth follow up | 1 mth Munk | 1mth FDDT | 1 mth Ducts | 3 mth Follow up | 3mth Munk | 3mth FDDT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24/10/2012 | Kanniammal | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 2 | 16/11/2012 | Devaki | 1 | 0 | 0 | 1 | 2 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 |
| 3 | 29/11/2012 | Manickam | 1 | 0 | 0 | 1 | 2 | 2 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 4 | 29/11/2012 | Kokila | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 5 | 05/12/2012 | Sarojamma | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | | | | 0 | | |
| 6 | 06/12/2012 | Lakshmiakka | 1 | 0 | 0 | 1 | 3 | 2 | 2 | 0 | | | | 0 | | |
| 7 | 12/12/2012 | Chitra | 1 | 0 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 8 | 12/12/2012 | Rajendran | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 9 | 26/12/2012 | Rukumani | 1 | 0 | 0 | 1 | 2 | 3 | 2 | 1 | 3 | 3 | 3 | 1 | 2 | 1 |
| 10 | 02/01/2013 | Poongodi | 0 | 0 | 0 | 1 | 3 | 2 | 3 | 1 | 3 | 3 | 3 | 1 | 4 | 4 |
| 11 | 02/01/2013 | Shafiula | 1 | 0 | 0 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 0 | 1 |
| 12 | 16/01/2013 | Selvamani | 1 | 0 | 0 | 1 | 3 | 2 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 13 | 22/01/2013 | Barani | 1 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 14 | 23/01/2013 | Aslam Basha | 1 | 3 | 0 | 1 | 0 | 1 | 2 | 0 | | | | 1 | 0 | 1 |
| 15 | 05/02/2013 | Shanthi | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 16 | 11/02/2013 | Sarala | 0 | 0 | 0 | 1 | 4 | 4 | 3 | 1 | 4 | 4 | 1 | 0 | | |
| 17 | 12/02/2013 | Krishnaveni | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 0 | | | | 0 | | |
| 18 | 20/02/2013 | Jayammal | 1 | 0 | 0 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 |
| 19 | 26/02/2013 | Shantha | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 20 | 27/02/2013 | Murugesan | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 21 | 27/02/2013 | Shamshune | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | | | | 0 | | |
| 22 | 27/02/2013 | Kasthuri | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 23 | 06/03/2013 | Suseela | 1 | 0 | 0 | 2 | 0 | 2 | 2 | 1 | 0 | 1 | 2 | 1 | 1 | 2 |
| 24 | 04/04/2013 | Krishnammal | 1 | 0 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 2 | 2 | 1 | 0 | 2 |
| 25 | 04/04/2013 | Krishnaveni | 1 | 0 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 26 | 11/04/2013 | Sheela | 1 | 3 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 27 | 18/04/2013 | Babu | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 28 | 18/04/2013 | Basheera Bee | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 29 | 18/04/2013 | Rathinam | 1 | 0 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 1 | 1 |
| 30 | 25/04/2013 | Lakshmi | 1 | 0 | 0 | 1 | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 1 | 2 | 2 |

| No | Date | Name | Osteum Group | OP complication 1 | OP compli 2 | S/R | 1 wk Munk | 1 wk FDDT | 1 wk Ducts | 1mth follow up | 1 mth Munk | 1mth FDDT | 1 mth Ducts | 3 mth Follow up | 3mth Munk | 3mth FDDT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 25/04/2013 | Menaka | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 32 | 25/04/2013 | Panchatsaram | 1 | 0 | 0 | 1 | 3 | 3 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 33 | 25/04/2013 | Baby | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 34 | 09/05/2013 | Krishnammal | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 35 | 09/05/2013 | Saraswati | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 36 | 09/05/2013 | Datchayani | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 37 | 15/05/2013 | Jamuna | 1 | 0 | 0 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 2 |
| 38 | 16/05/2013 | Jayamary | 1 | 0 | 0 | 1 | 2 | 3 | 3 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 39 | 16/05/2013 | Shanma | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 40 | 16/05/2013 | Basheera Bee | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 0 |  |  |  | 1 | 0 | 1 |
| 41 | 22/05/2013 | Vasantha | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 42 | 23/05/2013 | Kirubai | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 43 | 27/05/2013 | Venda | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 2 | 2 | 1 | 0 | 2 |
| 44 | 29/05/2013 | Amarnath | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 45 | 30/05/2013 | Malliga | 1 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 0 | 1 |
| 46 | 03/06/2013 | Dakshinamoorthy | 0 | 0 | 0 | 1 | 3 | 4 | 1 | 0 |  |  |  | 0 |  |  |
| 47 | 06/06/2013 | Visalatchi | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 48 | 06/06/2013 | Govinda Singh | 1 | 1 | 3 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 49 | 06/06/2013 | Baby | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 50 | 13/06/2013 | Mageshwari | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 0 |  |  |  | 0 |  |  |
| 51 | 17/06/2013 | Banumathy | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 0 | 2 |
| 52 | 20/06/2013 | Laxmi | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 53 | 27/06/2013 | Razia Begum | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 54 | 27/06/2013 | Chinnammal | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 55 | 27/06/2013 | Ramamoorthy | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 56 | 04/07/2013 | Fathima Bee | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 57 | 04/07/2013 | Sujatha | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 58 | 04/07/2013 | Kasi | 1 | 3 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 59 | 23/07/2013 | Gnanavel | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |
| 60 | 25/07/2013 | Chinnathai | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 |

| No | Date | Name | 3mth Ducts | Post OP complications |
|---|---|---|---|---|
| 1 | 24/10/2012 | Kanniammal | 2 | 0 |
| 2 | 16/11/2012 | Devaki | 3 | 0 |
| 3 | 29/11/2012 | Manickam | 2 | 0 |
| 4 | 29/11/2012 | Kokila | 2 | 0 |
| 5 | 05/12/2012 | Sarojamma | | 0 |
| 6 | 06/12/2012 | Lakshmiakka | | 0 |
| 7 | 12/12/2012 | Chitra | 2 | 0 |
| 8 | 12/12/2012 | Rajendran | 2 | 0 |
| 9 | 26/12/2012 | Rukumani | 3 | 0 |
| 10 | 02/01/2013 | Poongodi | 1 | 3 |
| 11 | 02/01/2013 | Shafiula | 2 | 0 |
| 12 | 16/01/2013 | Selvamani | 2 | 0 |
| 13 | 22/01/2013 | Barani | 2 | 0 |
| 14 | 23/01/2013 | Aslam Basha | 2 | 0 |
| 15 | 05/02/2013 | Shanthi | 2 | 0 |
| 16 | 11/02/2013 | Sarala | | 3 |
| 17 | 12/02/2013 | Krishnaveni | | 0 |
| 18 | 20/02/2013 | Jayammal | 3 | 0 |
| 19 | 26/02/2013 | Shantha | 2 | 0 |
| 20 | 27/02/2013 | Murugesan | 2 | 0 |
| 21 | 27/02/2013 | Shamshune | | 0 |
| 22 | 27/02/2013 | Kasthuri | 2 | 0 |
| 23 | 06/03/2013 | Suseela | 2 | 0 |
| 24 | 04/04/2013 | Krishnammal | 2 | 0 |
| 25 | 04/04/2013 | Krishnaveni | 2 | 0 |
| 26 | 11/04/2013 | Sheela | 2 | 0 |
| 27 | 18/04/2013 | Babu | 2 | 0 |
| 28 | 18/04/2013 | Basheera Bee | 2 | 0 |
| 29 | 18/04/2013 | Rathinam | 2 | 0 |
| 30 | 25/04/2013 | Lakshmi | 3 | 2 |

| No | Date | Name | 3mth Ducts | Post OP complications |
|---|---|---|---|---|
| 31 | 25/04/2013 | Menaka | 2 | 0 |
| 32 | 25/04/2013 | Panchatsaram | 2 | 0 |
| 33 | 25/04/2013 | Baby | 2 | 0 |
| 34 | 09/05/2013 | Krishnammal | 2 | 0 |
| 35 | 09/05/2013 | Saraswati | 2 | 0 |
| 36 | 09/05/2013 | Datchayani | 2 | 0 |
| 37 | 15/05/2013 | Jamuna | 3 | 0 |
| 38 | 16/05/2013 | Jayamary | 2 | 0 |
| 39 | 16/05/2013 | Shanma | 2 | 0 |
| 40 | 16/05/2013 | Basheera Bee | 2 | 0 |
| 41 | 22/05/2013 | Vasantha | 2 | 0 |
| 42 | 23/05/2013 | Kirubai | 2 | 0 |
| 43 | 27/05/2013 | Venda | 2 | 0 |
| 44 | 29/05/2013 | Amarnath | 2 | 0 |
| 45 | 30/05/2013 | Malliga | 2 | 0 |
| 46 | 03/06/2013 | Dakshinamoorthy | | 3 |
| 47 | 06/06/2013 | Visalatchi | 2 | 0 |
| 48 | 06/06/2013 | Govinda Singh | 2 | 0 |
| 49 | 06/06/2013 | Baby | 2 | 0 |
| 50 | 13/06/2013 | Mageshwari | | 0 |
| 51 | 17/06/2013 | Banumathy | 2 | 0 |
| 52 | 20/06/2013 | Laxmi | 2 | 0 |
| 53 | 27/06/2013 | Razia Begum | 2 | 0 |
| 54 | 27/06/2013 | Chinnammal | 2 | 0 |
| 55 | 27/06/2013 | Ramamoorthy | 2 | 0 |
| 56 | 04/07/2013 | Fathima Bee | 2 | 0 |
| 57 | 04/07/2013 | Sujatha | 2 | 0 |
| 58 | 04/07/2013 | Kasi | 2 | 0 |
| 59 | 23/07/2013 | Gnanavel | 2 | 0 |
| 60 | 25/07/2013 | Chinnathai | 2 | 0 |