A Dissertation on

"A STUDY ON COMPARISON OF SUBCUTICULAR SUTURING AND TISSUE ADHESIVE -2-OCTYL CYANOACRYLATE FOR SKIN CLOSURE IN THYROIDECTOMY AT RGGGH,CHENNAI".

by

REGISTER NUMBER: 221811004

A DISSERTATION SUBMITTED TO
THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY
CHENNAI

In partial fulfillment of the Regulations
for the award of the Degree

M.S. (GENERAL SURGERY)

INSTITUTE OF GENERAL SURGERY

MADRAS MEDICAL COLLEGE

CHENNAI

MAY – 2022

CERTIFICATE BY THE GUIDE

This is to certify that this dissertation entitled **"A STUDY ON COMPARISON OF SUBCUTICULAR SUTURING AND TISSUE ADHESIVE -2-OCTYL CYANOACRYLATE FOR SKIN CLOSURE IN THYROIDECTOMY AT RGGGH, CHENNAI"** is a bonafide research work of Post graduate M.S. student, **Dr.DEVI.T,** in the Institute of General Surgery, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai, in partial fulfillment of the requirement for the degree of **M.S.** in **GENERAL SURGERY** to be held in **MAY 2022** under my guidance and supervision in 2021.

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I **Dr. DEVI.T** hereby solemnly declare that this dissertation entitled **"A STUDY ON COMPARISON OF SUBCUTICULAR SUTURING AND TISSUE ADHESIVE -2-OCTYL CYANOACRYLATE FOR SKIN CLOSURE IN THYROIDECTOMY" AT RGGGH, CHENNAI** is a bonafide and genuine research work carried out by me. This is submitted to the Tamil Nadu Dr.M.G.R. Medical University, Chennai, in partial fulfillment of the regulations for the award of M.S. degree (Branch I) General Surgery.

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Lastly and most importantly, I express my most sincere and heartfelt thanks to all my patients without whom this study would have not been possible.

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INTRODUCTION

A basic need for skin closure is wound approximation. A good wound healing and cosmetically good scar is an ideal surgeon's practice. Various skin closure techniques are available like staplers, skin glue and adhesive tapes. Based on efficacy of advanced suture techniques patient may be benefited with better cosmesis, lesser pain in postoperative period, and less wound infection, lesser hospital stay. Hence it is better to study and compare adhesive glue with suture material for the better outcome for the patient.

Thyroid surgeries are one of the most commonly performed surgeries by a general surgeon. Surgery in this region also raises significant aesthetic problems as the neck region is easily visible to other people and therefore it is very important. These surgeries classically require an anterior neck incision that are at the risk of undesirable aesthetic results when the scars do not form as expected.

Moreover these surgeries are practiced in young woman and incidence of thyroid disease is three times more common in women than men. Also incidences peaks in third and fourth decades of life. For all these reasons the cosmetic outcomes of this kind of surgery is very important.

Various skin closure techniques like Sutures, tapes, staplers and tissue adhesive glue are available to achieve cosmetically better scar. Skin closure should be safe, pain free and to achieve better scar.

There are various methods of skin closure which include Suture materials, staplers, tapes and tissue adhesive glue. The 2- octyl cyanoacrylate adhesive glue is used for various applications like tissue adhesion, hemostasis, closure of CSF leaks, vascular embolisation , application of skin grafts and skin closure. So, this study is designed to study and compare the efficacy of tissue adhesive with subcuticular suture in thyroidectomy.

AIM AND OBJECTIVES

Aim of the study :

To compare the subcuticular and 2-octyl cyanoacrylate glue for skin closure in thyroidectomy at RGGGH, Chennai".

Objectives :

A Comparison of subcuticular suture using 3.0 Monocryl and 2-octyl cyanoacrylate tissue adhesive glue in thyroidectomy skin closure in view of the following

- Time taken for skin closure
- Post operative pain using visual analogue scale
- Wound scar using Stony Brook scar evaluation scale

ELIGIBILITY CRITERIA

INCLUSION CRITERIA:

All patients undergoing Total thyroidectomy and Hemithyroidectomy.

EXCLUSION CRITERIA:

- Diabetic
- Patient undergoing total thyroidectomy for malignancy with neck dissection/recurrence/partial excision
- Known bleeding diathesis

- Known personal and family history of keloid formation or scar hypertrophy
- Known allergy to cyanoacrylate or formaldehyde

SELECTION OF SUBJECTS:

Patients undergoing total thyroidectomy and hemi thyroidectomy in RGGGH, Chennai

STUDY PERIOD: 1 year

PLACE OF STUDY:

Institute of General surgery

Rajiv Gandhi Government General Hospital, Chennai

DESIGN OF STUDY :

Prospective study

PARTICIPANTS: any case of Total thyroidectomy and Hemi thyroidectomy excluding the patients with diabetics, malignancy, recurrence, risk of keloid formation, allergic to cyanoacrylate and bleeding disorders.

DATA COLLECTION: Data regarding History, surgery done and outcome

METHODS: Observation Study

ETHICAL CLEARANCE: Approval obtained

CONSENT: informed and written consent from all patients

ANALYSIS: using CHI SQUARE test- p value

CONFLICT OF INTEREST: none

FINANCIAL SUPPORT: NIL

Materials used :

1. 2- Octyl cyanoacrylate tissue adhesive Glue

2. 3.0 monocryl for subcuticular suture

REVIEW OF LITERATURE

SKIN LAYERS:

There are three layers of skin

1.Epidermis (outermost layer)

2. Dermis

3.Subcutaneous tissue.

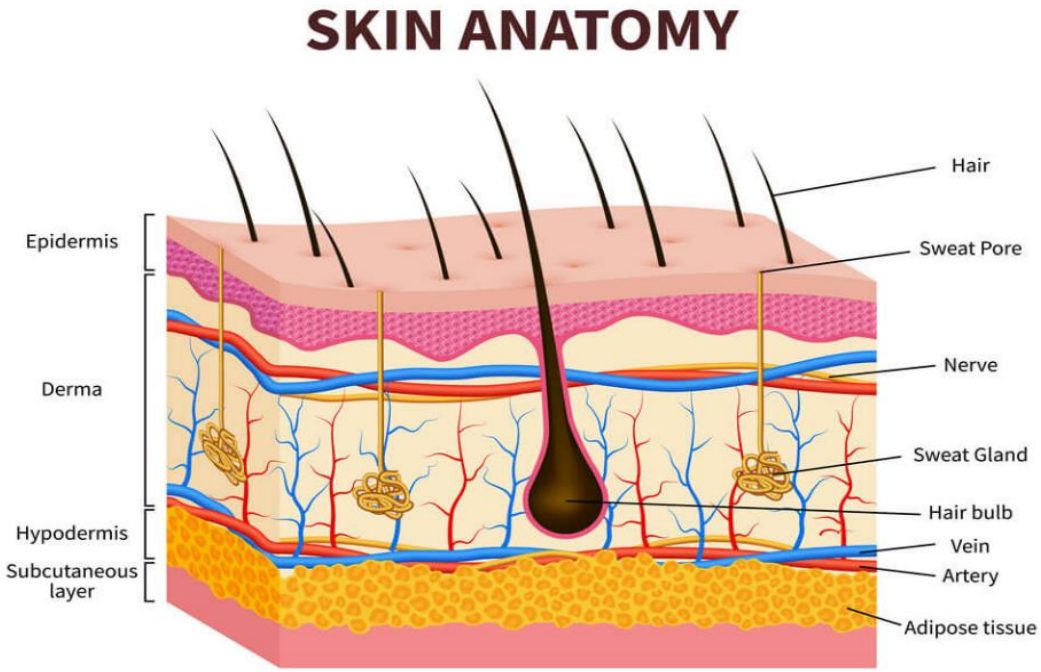


Fig:1 shows layers of the skin

1.Epidermis:

This is the outer layer. It has three types of cells, the keratinocytes present in the base of epidermis. Keratinocytes travel from the base of the epidermis to the surface of the skin, lose water , harden and die. Keratinocytes are continually shed.

The other cells are melanocytes, which produce the pigment for melanin. Melanin is responsible for skin color. The other cells are Langerhans cells, which are part of the immune system and protect the epidermis from pathogens.

Dermis

The layer just below the epidermis is called the dermis. This layer is the thickest of the three layers and contains fibroblasts. Fibroblasts contain abundant collagen and elastin protein, which enhances the elasticity of the skin. It contains small capillaries and lymph vessels in the skin. It contains numerous sebaceous glands that produce sebum. Sebum reaches the epidermis through small hair follicles. This protective substance smoothens and protects the skin. It contains superficial and deep plexuses, which are interconnected by communicating blood vessels.

Subcutaneous tissue:

This is the innermost layer of the skin and contains adipocytes. It insulates the body and acts a protective layer. This layer contains sweat glands. Hair follicles are connected to a smooth muscle system called Elector Pili.

Appendages:

Sweat glands

Sweat glands are widely distributed throughout the surface of the skin, and helps maintain body temperature. There are two types of sweat glands: eccrine glands and apocrine glands.Eccrine glands open to the surface of the skin through ducts and apocrine glands opens through hair follicles.

Sebaceous glands :

These glands produce sebum, which is oily in nature. Sebum acts as a lubricant, moisturizes the skin and prevents hair from becoming brittle. The acidic medium of sebum also prevents bacterial colonization. Most of the ducts of these glands lead to hair follicles. Hair follicles are composed of hard, keratinized epithelial cells.

EMBRYOLOGY OF THYROID GLAND :

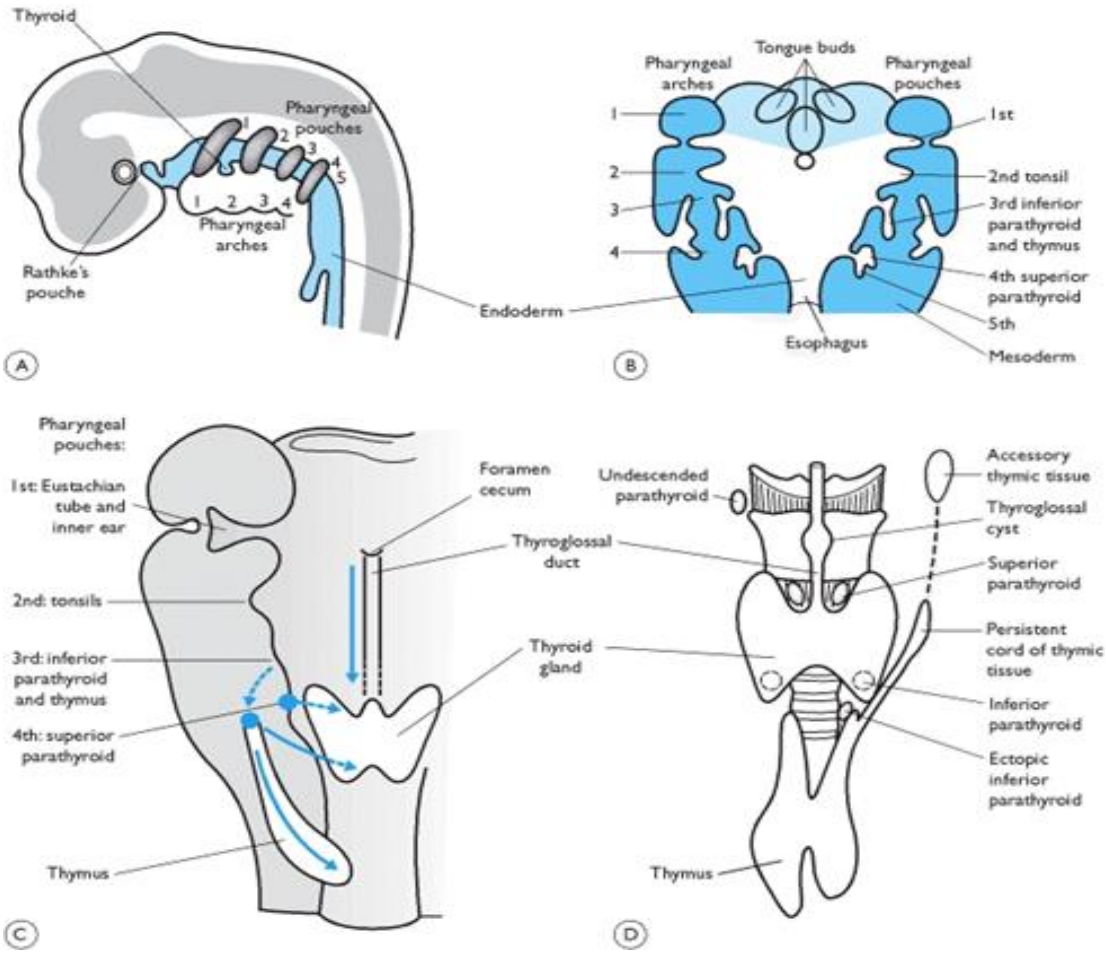


Fig:2 shows embryology of thyroid gland

The thyroid gland is embryonically derived from the foramen cecum at the base of the tongue. It descends on the neck and forms a bilobed structure. This descending pathway of the thyroid gland forms the thyroid duct, which is reabsorbed at 6 weeks of age. The distal part of the pathway, if persists , forms a pyramidal lobe. C cells originate from the

fourth pharyngeal pocket and migrate to the lateral and upper two-thirds of the posterior lobe of the thyroid .

The embryological origin of thyroid are associated with a variety of abnormalities. Athyreosis is a complete lack of lateral lobes and isthmus. Thyroglossal cysts and fistulas result from the retention of tissue on the path of descending thyroid gland. The lingual thyroid gland is when the median thyroid gland does not descend in a normal fashion.

Ectopic thyroid tissue is found in the central compartment of the neck, the lower pole of the normal thyroid gland, and sometimes in the anterior mediastinum. Initially ectopic thyroid tissues found in the lateral neck compartment was known as lateral aberrant thyroid, but at present thyroid tissue present lateral to the jugular vein is considered as metastatic deposits from the differentiated thyroid carcinoma (DTC).

THYROID GLAND

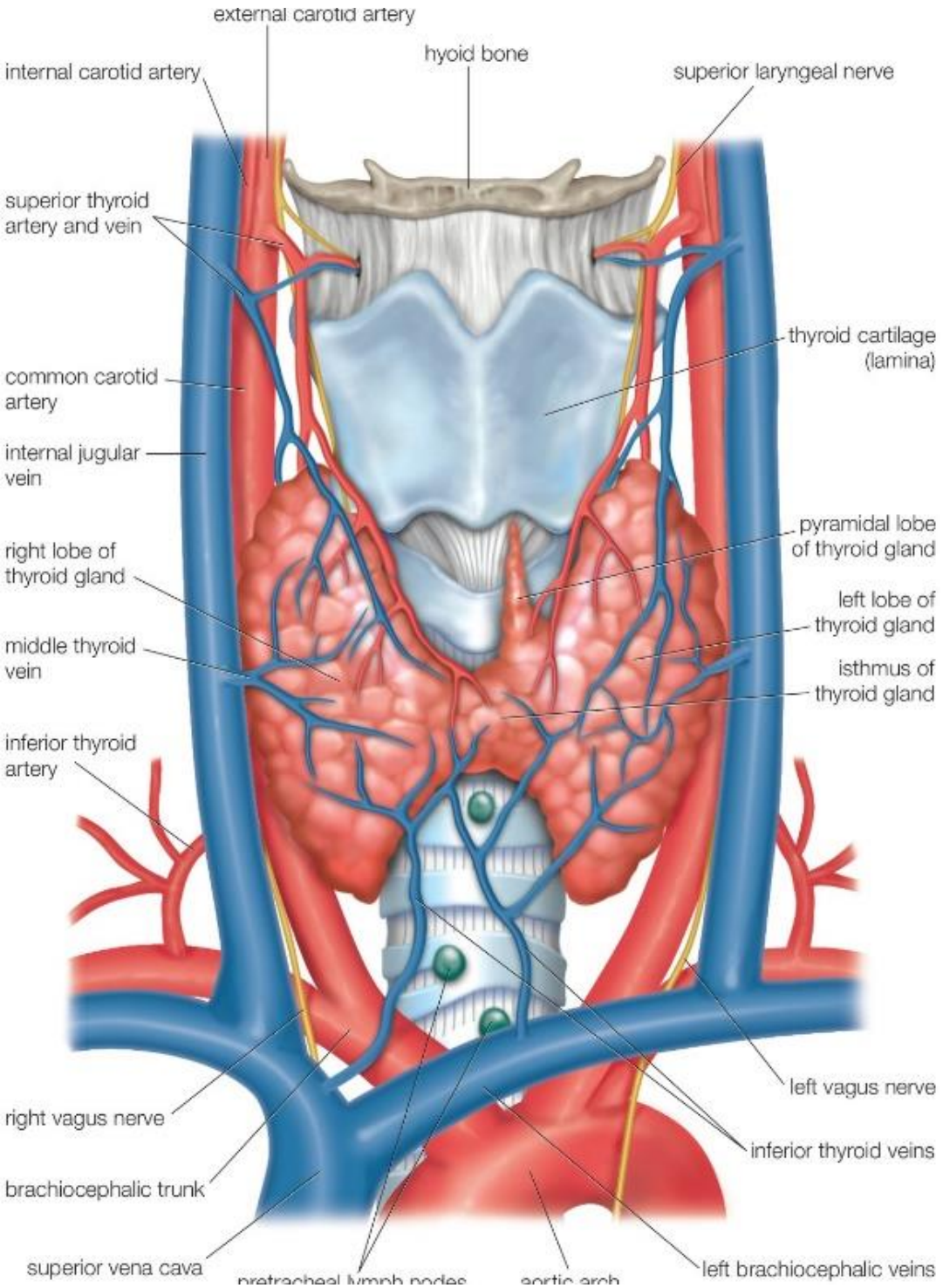


Fig:3 shows anatomy of thyroid gland and its blood supply.

A normal adult thyroid gland weighs about10 to 20g. Thyroid gland is a bilobed structure, adjacent to the thyroid cartilage and is anterolateral to the laryngeal tracheal junction. The thyroid gland encircles about 75% of the junction between the larynx and the trachea. The thyroid lobe is located outside the trachea and esophagus, anteromedial to the carotid sheath, sternocleidomastoid muscle, sternohyoid muscle and posteromedial to the sternothyroid muscle.

The two lobes of the thyroid gland are connected by a isthmus and situated at or just below the cricoid cartilage. A thin layer of connective tissue surrounds the thyroid. This tissue is part of the fascial layer that invests the trachea. This fascia coalesces with the thyroid capsule posteriorly and laterally to form a suspensory ligament termed as the Ligament of Berry, which is the primary point of fixation of the thyroid to surrounding structures. The ligament of Berry is closely attached to the cricoid cartilage.

NERVE SUPPLY OF THYROID GLAND

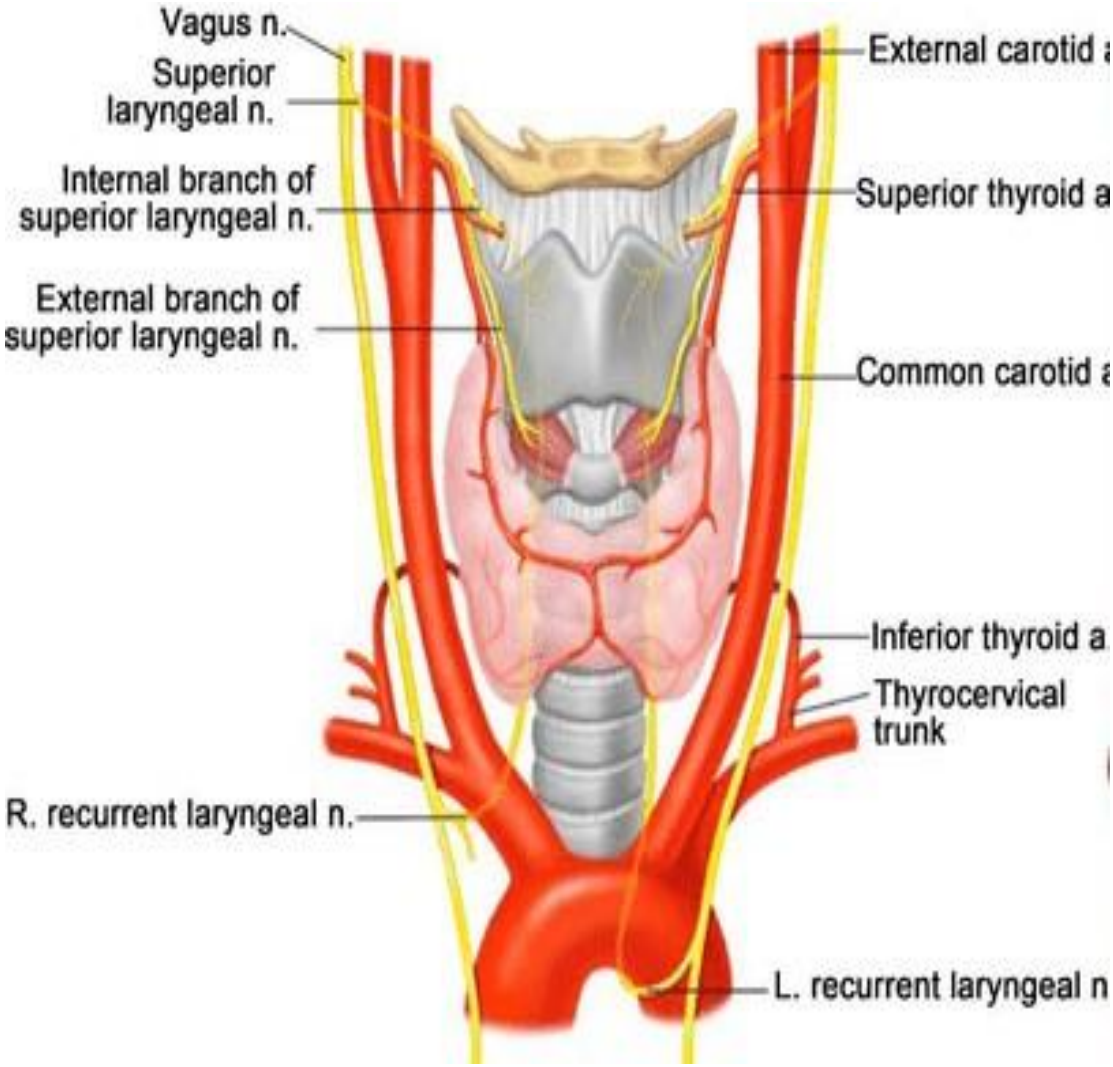


Fig:4 shows nerve supply of thyroid gland

The thyroid gland is related to two important nerves. **The superior laryngeal nerve**is a branch of the vagus that separates from the vagus nerve at the base of the skull and comes down towards the superior pole of the thyroid medial to the carotid sheath. At the level of the cornu of the hyoid, it divides into two branches. The larger internal branch which penetrates the thyrohyoid membrane and provides sensory innervation to the larynx cranial to the vocal folds. The smaller external branch continues along the lateral surface of the inferior pharyngeal constrictor muscle and descends anteriorly and medially along with the superior thyroid artery. Within 1 cm of the entrance into the thyroid capsule, the nerve generally takes a medial course and pierces the cricothyroid muscle, which it innervates. This nerve is at risk of being severed if the superior pole vessels are ligated at a distance above the superior pole of the thyroid. Damage to the external branch results in loss of voice quality or strength.

The Recurrent laryngeal nerves are so named because of their course. They course cranial after branching from the vagus and extends caudally. On the right side, the RLN originates from the vagus nerve. It crosses anterior to the subclavian artery. The right RLN can usually be found within one cm lateral to or within the tracheoesophageal groove. The nerve can usually be found immediately anterior or posterior to a main arterial trunk of the inferior thyroid artery. On the left side, the RLN separates from the vagus as that nerve passes anterior to the arch of the aorta. The left RLN passes inferior and posteromedial to the aorta at the ligamentum arteriosum and begins to ascend toward the larynx. It enters the tracheoesophageal groove as it ascends to the level of the lower pole of the thyroid. Both RLNs are consistently found within the tracheoesophageal groove when they are within 2.5 cm of their entrance into the larynx.

The RLN has mixed motor, sensory, and autonomic functions and innervates the intrinsic laryngeal muscles. Damage to a RLN results in the paralysis of the vocal cord on the affected side. Such damage might result in a cord that remains in a midline position or a para-median position. If the vocal cord remains paralyzed in an abducted position and closure cannot occur, a severely impaired voice and

ineffective cough also may result. If the RLNs are damaged bilaterally, complete loss of voice or airway obstruction may occur and possibly require an emergency surgical airway. Occasionally, bilateral damage can result in cords taking an abducted position; although this allows airway movement, it may result in upper respiratory infection as a result of ineffective cough and aspiration.

BLOOD SUPPLY OF THYROID GLAND

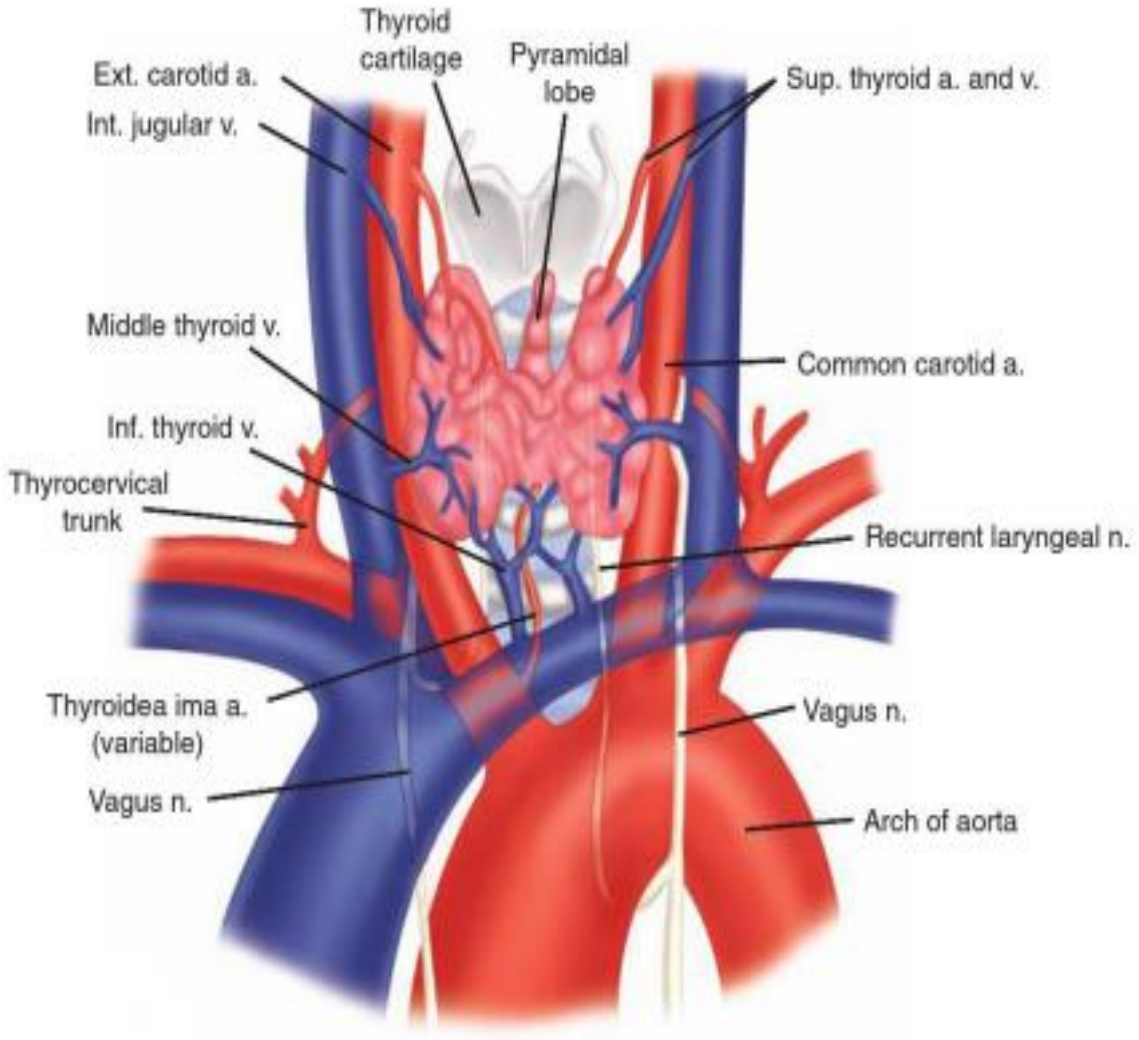


Fig 5: The above figure depicts the blood supply of the thyroid gland

The arterial supply to the thyroid gland consists of four main arteries. The **superior thyroid artery** is the first branch of the external carotid artery after the bifurcation of the common carotid artery. The superior thyroid artery and external branch of the superior laryngeal nerve lie immediately deep to the sternothyroid muscle as this muscle inserts on the thyroid cartilage.

The inferior thyroid artery originates from the thyrocervical trunk. It originates from the subclavian artery and ascends into the neck on either side posterior to the carotid sheath and then arches medially and enters the thyroid gland posteriorly, usually near the ligament of Berry. Despite the name "inferior thyroid artery," no direct arterial supply generally enters the inferior aspect of the thyroid.

However, an **arteria thyroidea ima** may be present in less than 5% of patients and usually arises directly from the innominate artery or from the aorta. The inferior thyroid artery has important anatomic relationships. The RLN is usually directly adjacent (in either an anterior or a posterior position) to the inferior thyroid artery, within 1 cm of its entrance into the larynx. Careful dissection of the artery is mandatory

and cannot be completed until the position of the RLN is absolutely defined.

Additionally, the inferior thyroid artery typically supplies the superior and the inferior parathyroid glands, and care must be taken to evaluate the parathyroids after division of the inferior thyroid artery. For this reason, the inferior thyroid artery should be divided at the distal branches into the thyroid, rather than at its main trunk.

Three pairs of venous systems drain the thyroid. **Superior venous drainage** is immediately adjacent to the superior arteries and joins the internal jugular vein at the level of the carotid bifurcation.

Middle thyroid veins may be single or multiple and course immediately laterally into the internal jugular vein. The inferior thyroid veins are usually two or three in number and descend directly from the lower pole of the gland into the innominate and brachiocephalic veins. These veins often descend in association with the cervical horn of the thymus gland.

LYMPHATIC DRAINAGE OF THE THYROID GLAND:

The thyroid gland and its neighbouring structures have rich lymphatics that drain the thyroid in almost every direction. Within the gland, lymphatic channels are present immediately beneath the capsule and communicate between lobes through the isthmus. This drainage connects to structures directly adjacent to the thyroid, with numerous lymphatic channels into the regional lymph nodes.

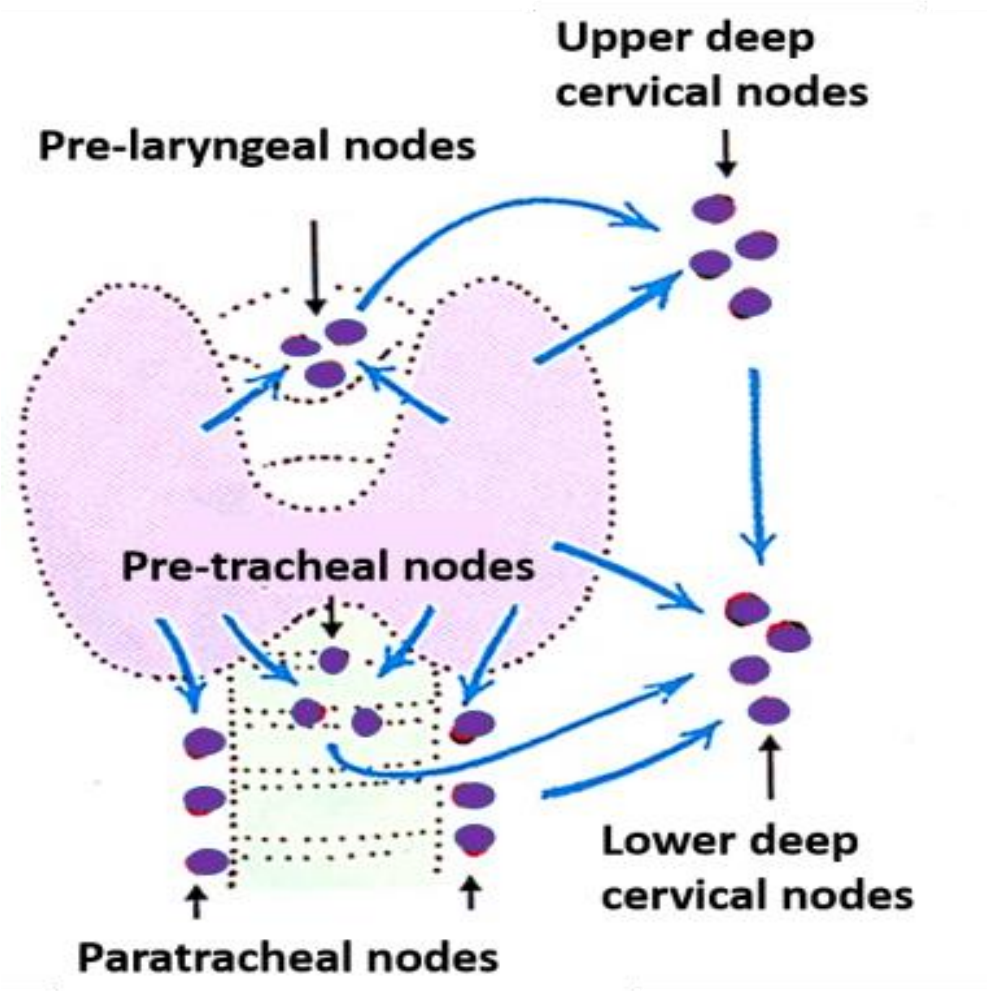


Fig 6: Lymphatic drainage of the thyroid

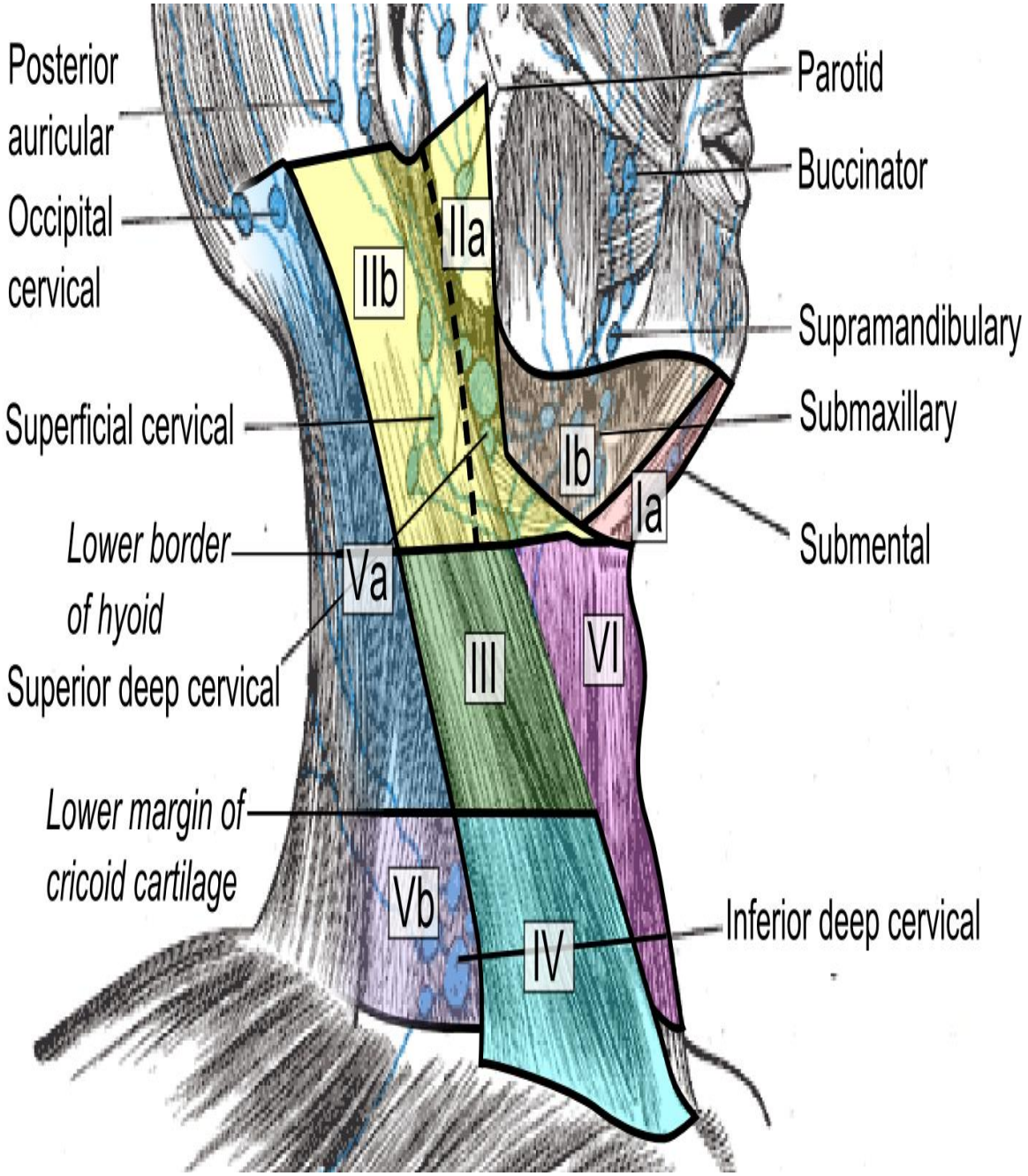


Fig:7 shows levels of neck node

Level I node consists of submental and submandibularnodes, above the hyoid bone and anterior to the posterior edge ofthe submandibular gland.

Level II, III, and IV nodes are arrayed along the jugularveins on each side,

Level V nodes are in the posteriortriangle, lateral to the lateral edge of the sternocleidomastoid muscle.

Level VI lymph nodes include prelaryngeal nodes (also known as delphian nodes); pretracheal nodes inferior to the isthmus; paratracheal nodes; tracheoesophageal groove lymph nodes

The upper mediastinal nodes are considered as level VII

Wound healing :

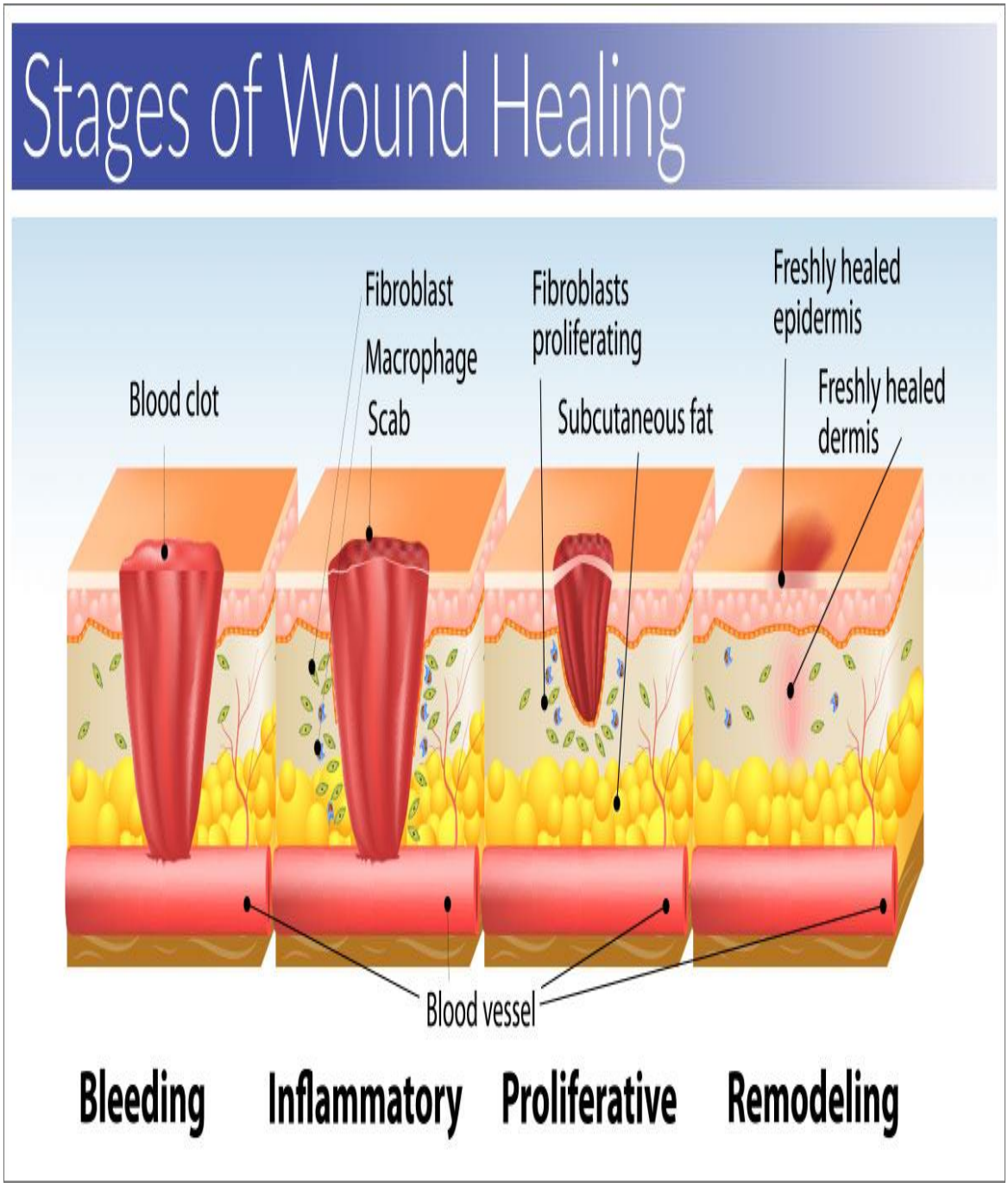


Fig:8 shows stages of wound healing

This is a complex series of events that begins at the moment of injury and can last months to years. Three categories of wound healing: primary, secondary and tertiary.

Primary wound healing closes the wound within hours of the onset of the wound and repairs a full-thickness surgical incision.

Secondary wound healing is caused by spontaneous wound closure and new epithelialization.

Tertiary wound closure, also known as delayed primary closure, involves the initial debridement of the wound over an extended period of time, followed by formal closure by sutures or some other mechanism.

STAGES OF WOUND HEALING:

Wound healing occurs in three or four stages.

(A) Inflammatory stage

(B) Proliferation stage

(C) Remodeling stage

Occasionally, the hemostatic stage occurs before the inflammatory stage or thedestructive phase occur following inflammation which acts as a cellular cleansing of the wound by macrophages.

Inflammatory stage;

Occurs shortly after a wound and lasts 2-3 days. When damage occurs, bleeding occurs, followed by vasoconstriction and thrombus formation. Platelets attach to injured endothelial cells (ADP) and also release some cytokines and alpha granules.

Several growth factors, namely platelet growth factor (PDGF), transforming growth factor (TGF BETA), and platelet factor IV, also attract inflammatory cells such as polymorphonuclear lymphocytes (PMNs) and macrophages. Release. Vascular amines such as histamine, serotinin, and prostaglandins are released, vascular permeability increases, and infiltration of inflammatory cells increases. Macrophages play an important role in the removal of inactivated tissue and microorganisms.

Proliferation phase;

This phase begins on the third day and continues until the third weeks. It consists of fibroblast activity with collagen production. Ground substances such as glycosaminoglycans and proteoglycans, Growth of new blood vessels (angiogenesis) and reepithelialization of wound surfaces.

Vitamin C is required for fibroblasts to produce collagen. Granulation tissue is formed in the early part of this phase, in which the increase in collagen increases the tensile strength of the wound. Type III collagen is, which is deposited and randomly placed at this stage

REMODELING PHASE;

This is the stage when collagen matures. Type III collagen is replaced with type I collagen in a 4: 1 ratio. There is a realignment of collagen fibers, as well as reduced wound vessel distribution and wound contractions during the remodeling phase.

Factors Affecting Wound Healing;

1. Wound site
2. Surrounding structures.
3. Injury mechanism
4. Contamination
5. Loss of tissue

6. Other regional factors;

(a) vascular insufficiency,

(b) prior radiation,

(c) pressure.

7. Systemic factors such as malnutrition, diabetes, drugs such as steroids and immunodeficiencies, and smoking also affect wound healing.

SURGICAL SITE INFECTIONS:

SSI is the most common complication following surgical procedures. It is due to virulent bacterial entry, altered wound microenvironment and changed host defense. It can be prevented by better preoperative preparation, better surgical techniques, adherence to principles of preventive antibiotic therapy, proper infection control during surgery. The most common organism causing SSI'S is staphylococcus aureus. Other organism include clostridia, gram negative bacteria. The common source of infection that cause SSI'S include surgical wards, wounds, catheters, drains, sputum, urine, feaces and operating room without proper ventilation, nurses, surgeons. Operation techniques, sterilization of instruments also the source of infection.

CLASSIFICATION OF SURGICAL WOUNDS:

1.Clean wounds – operative procedure does not involve colonized viscus.

2. Clean-contaminated –procedure enters the colonized viscus but under controlled circumstances.

3. Contaminated wounds –surgical site is grossly contaminated in the absence of obvious infection.

4. Dirty wounds – surgical procedure is performed when active infection is present.

CLASSIFICATION OF SURGICAL SITE INFECTIONS;

A) DEPTH OF WOUND INFECTION;

I) SUPERFICIAL SSI;

Superficial incisional SSI involves only skin and subcutaneous tissue and occur within 30 days of surgery. Criteria for superficial SSI include purulent discharge, at least one sign of inflammation, organism

isolated from fluid or tissue, wound is deliberately opened by surgeon.

II) DEEP INCISIONAL SSI;

It involves deeper tissue and occur within 30 days of surgery or 1year if an implant is present. Criteria of deep incisional SSI include purulent discharge from deeper incision site without organ /space involvement, facial dehiscence or deliberate separation by surgeon, deep abscess, identified by radiology/reoperation/histopathology or attending physician declares deep infection present.

III) ORGAN SPACE INFECTION;

It is same as deep incisional SSI with exception that pus drained from organ space site.

B) WOUND INFECTION ACCORDING TO AETIOLOGY;

I) Primary infection – wound is the primary site of infection.

II) Secondary infection – It is not directly related to the wound .

C) WOUND INFECTION ACCORDING TO TIME;

I) Early infection- within 30 days of surgical procedure.

II) Intermediate infection - between 1-3 months after wards.

III)Late infection -3 months after surgery.

D) WOUND INFECTION ACCORDING TO SEVERITY;

I) Minor - discharge without cellulitis or deep tissue destruction.

II)Major - discharge of pus associated with tissue breakdown partial or total dehiscence of the deep fascial layers of the wound , or if systemic illness is present.

SURGICAL PRINCIPLES OF WOUND CLOSURE SUTURES:

Surgical Principles of Wound Closure :

Sutures are materials used to suture body tissues such as blood vessels and skin. The New materials such as cotton, linen, tendons, intestines and metal wires have been introduced into surgery. Today's sutures have evolved in a way that has resulted in the creation of specific materials for

specific procedures. Using the correct sutures on the correct tissue during surgery can help with proper wound healing and prevent complications during recovery.

SUTURE CHARACTERISTICS

The ideal suture material property is .

1. High tensile strength .
2. Strength must be uniform
3. Must be uniform diameter.
4. Suture is safe during healing time, after which should be reabsorbed immediately
5. Must be easy to use
6. Must be packed tightly and Sterilized
7. Requires a long shelf life
8. Must remain strong until use
9. The knot must remain fixed after application
10. Absence of irritants and impure substances
11. Must be inactive and must not provoke a reaction in the body
12. Performance must be constant and predictable

The size of the suture is determined by the diameter of the suture. The smallest suture size can be sufficient to heal wounds. This helps minimize trauma to wounds and reduce foreign body reactions and tissue inflammation. The size of the suture is indicated by a number of zeros. The smaller or smaller the number of 0s , the larger the diameter. For example, size 30 or 000 is , which is less than 20 or 00 in diameter. The size is directly proportional to tensile strength. Tensile strength is the force that a suture can withstand when tied before it breaks.

Monofilament VS. Multifilament sutures :

Sutures are categorized based on the number of strands of each suture. They are monofilament and multifilament sutures. The monofilament suture contains only one thread. The suture is simple because the provides minimal resistance as the passes through the tissue. They also prevent the latent of the organism and prevent wound infections. Therefore, the monofilament suture is suitable for vascular anastomosis and is easy to bind. However, squeezing the suture during handling can cause weaknesses in the strand and damage the suture. The multifilament suture contains a large number of twisted or braided filaments or strands. This increases the tensile strength of the and

increases the pliability and flexibility. They can also be coated to help smooth passage through tissues such as intestinal tissue

Absorbable vs.non Absorbable Sutures

Sutures are classified according to their absorption characteristics. Absorbable sutures rapidly break down in body tissue and lose tensile strength within 60 days. Non-absorbable sutures are sutures that can maintain tensile strength even after 60 days. Absorbable sutures are made from mammalian collagen or synthetic polymers. Some sutures are quickly absorbed and some withstand absorption longer due to addition of some chemical substances . Some sutures are dyed to improve tissue visibility.

Naturally absorbable suture:

It is digested in the body by enzymes which attacks and destroy the strands. Synthetic sutures undergo a hydrolysis process in which water slowly penetrates the strands and breaks down the polymer chains. Hydrolysis with water reduces the degree of tissue reaction compared to the natural material . The suture is absorbed in two stages. The first step is tensile strength gradually decreases linearly and occurs in the first

weeks after use. The second stage overlaps with the second half of the stage 1 and is characterized by a decrease in suture volume. The suture is gradually removed by leukocyte infiltration at suture . The loss of suture strength and the rate at which it is absorbed are two different phenomena. The suture can quickly lose strength, but it is slowly absorbed or else can maintain its strength for a long period of time until the wound heals, and the can be quickly absorbed later without any detectable trace.

The draw backs of absorbable sutures are as follows:

The presence of infection or lack of protein can accelerate the absorption rate and lead to a decrease in tensile strength. For patients with impaired wound healing, resorbable sutures do not give good results. Therefore, the use of resorbable sutures in such situations results in increased postoperative complications as the suture strands cannot withstand the stress until wound healing is fully completed. Non-absorbable sutures are not digested by the body's enzymes and are not subjected to hydrolysis in the body. Fibroblasts encapsulate the suture.

Use of non-absorbable sutures:

- Skin closure after surgery or wounds after trauma.
- It is permanently trapped in your body.
- It is used for patients who are allergic to absorbable sutures and are prone to keloids or hypertrophic scars.

Some examples of suture materials:

Silk

Silk was first widely used as a suture material in the 1890s. It is a braided material formed from the protein fibres produced by silkworm larvae. Although silk is considered a non-absorbable material, it is gradually degraded in tissue over 2 years. Silk has excellent handling and knot tying properties and is the standard to which all other suture materials are compared. Its knot security is high, tensile strength low, and tissue reactivity high. Suture removal can be difficult and painful because the braided material becomes infiltrated with cells and encrusted with debris while the sutures are implanted in the skin.

Nylon:

Introduced in 1940, nylon was the first synthetic suture available, and it is the most commonly used non absorbable material in dermatologic surgery. It is available in both monofilamentous and multifilamentous forms. Nylon has a high tensile strength and, although it is classified as non-absorbable, it loses tensile strength when buried in tissue. Multifilamentous forms retain no tensile strength after being in tissue for 6 months, whereas monofilamentous forms retain as much as two thirds of their original strength after 11 years. Monofilament nylon is stiff, therefore, handling and tying are difficult and knot security is low. The suture also may cut easily through thin tissue. Multifilamentous forms have better handling properties but greater tissue reactivity. Monofilament nylon is relatively inexpensive and available as black, green, or clear. Although its greatest use is as a percutaneous suture, because of its low tissue reactivity, nylon (clear) can be used as a buried suture in situations in which prolonged dermal support is necessary.

Polypropylene:

Polypropylene (Proline; Ethicon) is a monofilament synthetic suture that was introduced in 1962. Its tensile strength is lower than that of the other synthetic nonabsorbable sutures. Its handling, tying and knot security are poor as a result of its stiff nature and high memory. An additional throw is needed for adequate knot security. A method to improve security is the use of thermocautery to fuse the knots or transform the ends into small beads. Tissue reactivity is extremely low for polypropylene, and unlike nylon, gradual absorption does not occur if it is buried in tissue. As result, polypropylene is an excellent choice for a buried suture for long term dermal support. It is a plastic suture that accommodates tissue swelling, therefore the likelihood of it cutting through the tissue and causing crosshatching is less than that of other materials, easily slides through tissue; this characteristic makes it the suture of choice for a running subcuticular closure.

Monocryl:

This is a synthetic absorbent monofilament suture. It is composed of polygrecapron 25, which is a copolymer of glycoside and epsilon caprolactone. It is commonly used for soft tissue approximation and ligation, and is widely used for subcutaneous dermis closure. It has low tissue reactivity, high tensile strength, high memory, and a half-life of 7-14 days.

Vicryl:

This is a synthetic absorbent multifilament suture. It is composed of Polyglactin 910. It is completely absorbed by acid hydrolysis within 56-70 days.

Glues and Adhesives:

Tissue adhesives (products made from synthetic material) and glues (products made from naturally occurring material) in surgical practice fall into 3 categories:

1. Biological natural compound_like fibrin, gelatin based, those of fibrin based glues function by reproducing the latter stage of normal clotting cascade leading to the formation of stable fibrin clot. These glues are used largely as haemostatic agents for bleeding surface and vascular Anastomosis. There is a wide range of fibrin product variety but in essence they fall into 2 types, two component fibrin and cryoprecipitate based glues, the composition of the two component type is basically the same, despite several different product proprietary names, the manydifferent preparation vary in the source of the fibrinogen (usually human), the thrombin (usually bovine).

1) Gelatin based glues:

These provide alternative re-absorbable biological glues that have greater bonding strength than fibrin based glue, GRFG (gelatin, resorcinol, formaldehyde & gluataradehyde) was the first generation. The second generations of gelatin hydrogel glues are much less toxic as the formaldehyde has been substituted with other cross linking agents. Fibrin adhesives can be created from autologous sources of pooled blood. They are typically used for haemostasis and can seal tissue while they do not have adequate tensile strength to close skin. Commercial preparation such as tisseel and hemaseel are Food and Drug

Administration (FDA) approved. Gelatin based glues are photochemically activated surgical tissue 'bonding for soldering' technology involves using photo reactive gelatins and a water soluble dysfunctional macromer polyethylene glycol diacrylate (PEGDA). Photoreactive groups, for example, fluorescein sodium salt, eosin Y, and rose bengal are incorporated in the gelatins, which are then suspended in a saline solution containing PEGDA forming a viscous. This forms an adhesive hydrogel within 1 minute when irradiated with the appropriate light. The resulting gel is tightly adherent to soft tissues such as the liver. Experimentally this photo curative gelatin glue has been used to seal effectively arteriotomies in canine abdominal or thoracic aortas. This glue has great potential application in laparoscopic surgery, as the percutaneous delivery of the glue followed by in situ photogelatin will result in prompt, safe and effective haemostasis [Nakayama et al 1999].

2) Adhesive based on protein engineering:

These polymers are still at the experimental stage, but show great promise as bio compatible and biodegradable internal sealants, they are based on proprietary protein engineering based on DNA gene technology, epithelization and healing with absorption of the material

were observed at 28 days, and the wound strength was equivalent to sutured controls.

3) Synthetic glues (Cyanoacrylates):

Fig 9: Derma bond synthetic glue

Since 1949 skin adhesives have been applied for medical use. Cyanoacrylate, the first adhesive used for skin closure, polymerizes in contact with human tissues. Polymerization is an exothermic chemical reaction that generates heat. Depending on the intensity of this reaction, it may cause pain when applied to the skin. Several other compounds from the same family of cyanoacrylate have been developed, such as methyl-cyanoacrylate, ethyl cyanoacrylate, isobuty1- cyanoacrylate, and butylcyanoarcylate. Histotoxicity responsible for the degree of inflammatory response, is related to the chain length of these compounds.

The last generation of these adhesives is octylcyanoacrylate, which results in less heat when applied, lower inflammatory reaction, and relatively higher tensile strength than the previous compounds. The cyanoacrylates are safe for clinical use with no reports of adverse effects or carcinogenicity.

The first cyanoacrylate glues comprised short-chain molecules with low breaking strength and a brittle consistency which left them prone to fracturing. Their use was restricted to low tension wounds where little tensile strength was required in the closure material and in vitro studies demonstrated a low wound tensile strength compared to monofilament sutures. Recently longer chain cyanoacrylates have been introduced with improved tensile strength and more powerful adhesion of wound edges. The longer chain cyanoacrylate is a combination of monomers and plasticizers. Its 3 dimensional wound breaking. Strength is 4 times that of n 2-butylcyanoacryalte. Animal studies suggest its tensile strength to be superior to adhesive tape strips, equivalent to subcuticular suturing but inferior to skin staples, and its use in higher tension wounds is not recommended.

Since its first use in 1996, the topical tissue adhesive has become a popular method for closing skin lesion, such as laparoscopic incisions and trauma induced lacerations, in areas of low tension.

Although cyanoacrylates are only licensed for external use, many studies report their use in various internal situations such as the repair of bronchopleural fistula, myocardial tears, mesh fixation for inguinal hernia and adhesions of bone or cartilage. In 1986 Shendra et.al., reported that bleeding from gastric varices could be controlled by sclerotherapy using the tissue adhesive agent butyl cyanoacrylate. Contaminated lacerations closed with suture materials are at increased risk of wound sepsis due to local tissue damage and the adsorption of pyogenic bacteria by suture material. Further one study suggests that combination of n- butyl-2 cyanoacrylate and a blue may be bacteriostatic for pyogenic gram – positive cocci. In contrast, Olson et al. found that Staph.epidermidis rapidly colonizes n-butyl-2 cyanoacrylate, producing a bio film of embedded bacteria. Cyanoacrylate is applied in a thin layer over the entire wound and extending 5-10 millimetre beyond the wound edge. The formation of the bond produces heat that the patient can feel. Once the layer is dried (10-30 seconds), a second layer is applied. Three to four layers are necessary. No additional bandaging is required, and the patient

is advised to not perform wound care at home. By 7-14 days, most of the adhesive sloughs with the epidermis, and the remainder may be removed with soap and water or petroleum jelly.

Fig 10: Contraindication of use of adhesives

Contra indications to use of skin Adhesives
Jagged or satellite lacerations
Bites, punctures or crush wounds
Contaminated wounds
Mucosal surfaces
Axillae and perineum (high moisture areas)
Hands, feet and joints (unless kept dry and immobilized)

Fig 11: Advantages of adhesive.

Advantages of Adhesive Vs Sutures
Maximum bonding strength at two and one half minutes
Equivalent in strength to healed tissue at 7 days post repair
Can be applied using only a topical anaesthetic, no needles
Faster repair time
Better acceptance by patients
Water resistant covering
Does not require removal of sutures

The clinical usage of tissue glue (octyl-cyanoacrylate adhesives) has been extensively studied for diverse applications including tissue adhesion, wound closure, hemostasis, closure of cerebrospinal fluid (CSF) leaks, vascular embolization and application of skin grafts.

Developed in 1949, the cyanoacrylate adhesives are applied topically to the outermost skin layer as monomers in a liquid form. On contact with tissue anions, they polymerize forming a strong bond that holds the apposed wound edges together. The cyanoacrylate adhesives usually slough off with wound re-epithelialization within 5-10 days and do not require removal.[1] Therefore a lot of studies are conducted using OCA for wound closure, especially in the region where cosmesis is required.

MATERIALS AND METHODS

Aim of the study:

To compare conventional suture (subcuticular) using 3.0 monocryl and tissue adhesive-2-octyl cyanoacrylate for skin closure in thyroidectomy at RGGGH, Chennai.

Materials Used:

1. 3.0 Monocryl subcuticular suture

2. 2-octyl cyanoacrylate tissue adhesive

Inclusion criteria:

All patients undergoing total thyroidectomy and hemi thyroidectomy

Exclusion criteria:

1.Diabetic

2.patient undergoing total thyroidectomy for malignancy with neck dissection/recurrence/partial excision

3.known bleeding diathesis

4.known personal and family history of keloid formation or scar hypertrophy

5.Known allergy to cyanoacrylate or formaldehyde

Methodology:

The study is to compare 3.0 monocryl subcuticular suture with the 2-octylcyanoacrylate tissue adhesive in thyroidectomy skin closure. This study was conducted in Rajiv Gandhi Government General Hospital ,Chennai ,for the duration of one year.

The Study comprised of 60 subjects.They are divided into 2 groups.In both the groups, thyroidectomy are done in the regular manner with ahorizontal skin crease incision, placed two finger breadth (2-3 cm) above the sternal notch extending from posterior border of one sternocleidomastoid to opposite side. Thyroidectomy was done in a usual manner. Duringclosure, platysmal sutures will be put to relieve the tension, obliterate the dead space and apposition of the wound edges. Then the wound is closed by 2-octylcyanoacrylate tissue adhesive or subcuticular sutures using 3.0 monocryl based on preoperatively divided group.These two groups are compared and analysed on post operative period of 1st week and 3rd week.Time taken skin closure,post operative pain and post operative scar will be analysed.post operative pain will be analysed using visual analog scale and post operative scar will be analysed by stony Brooke scar evaluation score.

Post operative pain

Postoperative pain following skin closure with tissue adhesive glue and subcuticular suture material is studied using VISUAL ANALOGUE SCALE.

VAS is numerical distress scale which has 0-10 numerical value. scale 0 indicates no pain and scale 10 indicates severe pain.

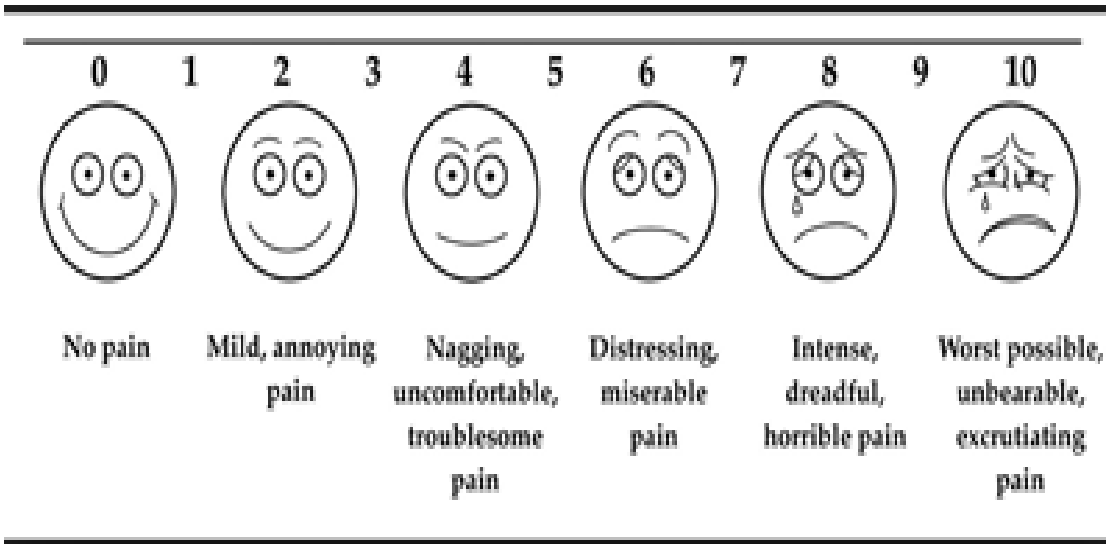


Fig:12 shows visual analog score for post operative pain

Post operative scar

The post operative scar is evaluated by stony brook scar evaluation score .It developed to measure short term cosmetic outcome of wounds. It incorporates assessments of individual attributes and overall appearance, to yield a score ranging from 0 (worst) to 5 best.

Attribute	Scar characteristic	Score
Width	>2 mm	0
	≤2 mm	**1**
Height	elevated/depressed compared to surrounding skin	0
	flat	**1**
Color	darker than surrounding area	0
	same or lighter than surrounding area	**1**
Hatch marks	present	0
	absent	**1**
Overall appearance	poor	0
	good	**1**
Total		5

Fig:13 stony brook scar evaluation score

Fig:14 shows application of derma bond (2-octy cyanoacrylate tissue adhesive) after the approximation of wound edges.

Fig:15 shows skin closure after derma bond

Fig:16 shows post operative picture of patient with 2-octyl cyanoacrylate tissue adhesive on pod 1st week.

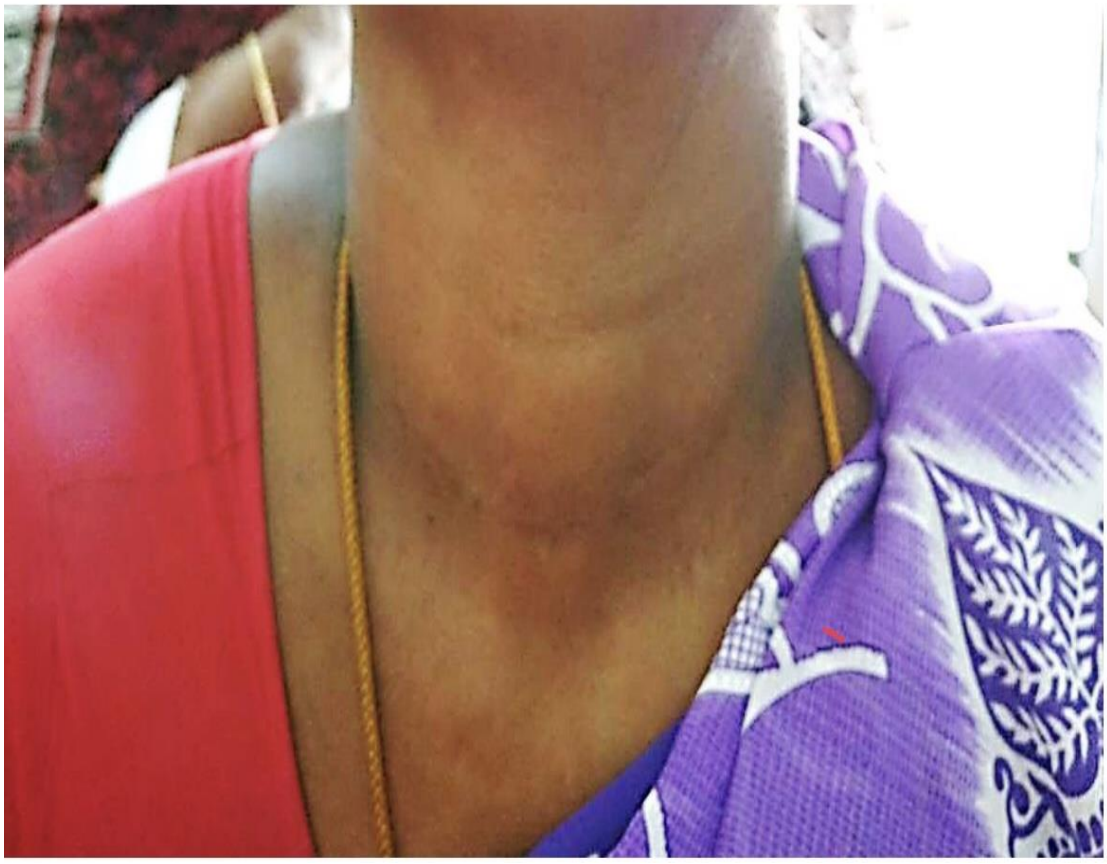


Fig:17 shows the post operative picture of patient with 2-octyl cyanoacrylate tissue adhesive on pod 3rd week

Fig:18 shows subcuticular suture using 3-0 monocryl

Fig:19 shows post operative picture of patient with 3-0 monocyrl subcuticular suture on pod 1st week.

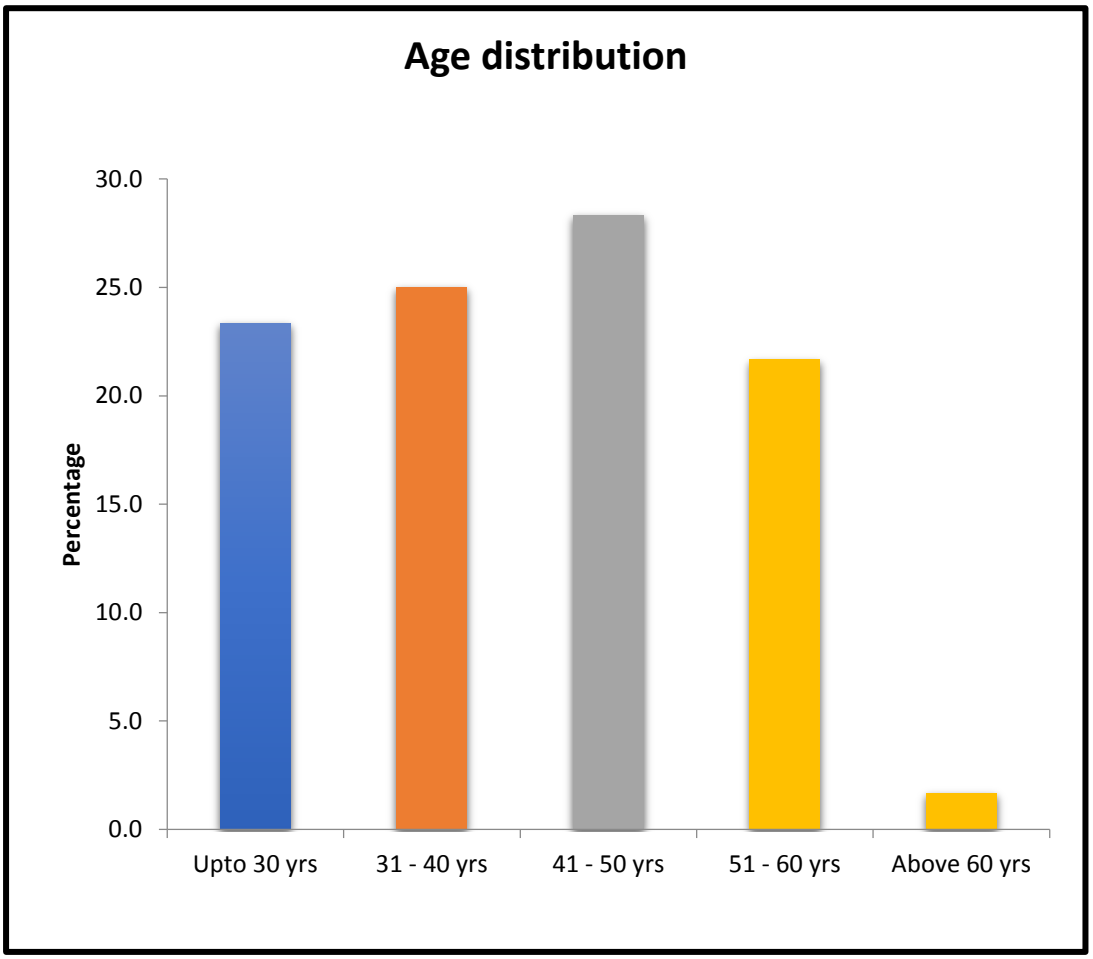
Fig:20 shows post operative picture of 3.0 monocryl subcuticular suture on pod 3rd week.

RESULTS

The collected data were analysed with IBM SPSS Statistics for Windows, Version 23.0 (Armonk, NY: IBM Corp).To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Unpaired sample t-test was used. To find the significance in categorical data Chi-Square test was used similarly if the expected cell frequency is less than 5 in 2×2 tables then the Fisher's Exact was used. In all the above statistical tools the probability value .05 is considered as significant level.

Table 1: Age distribution

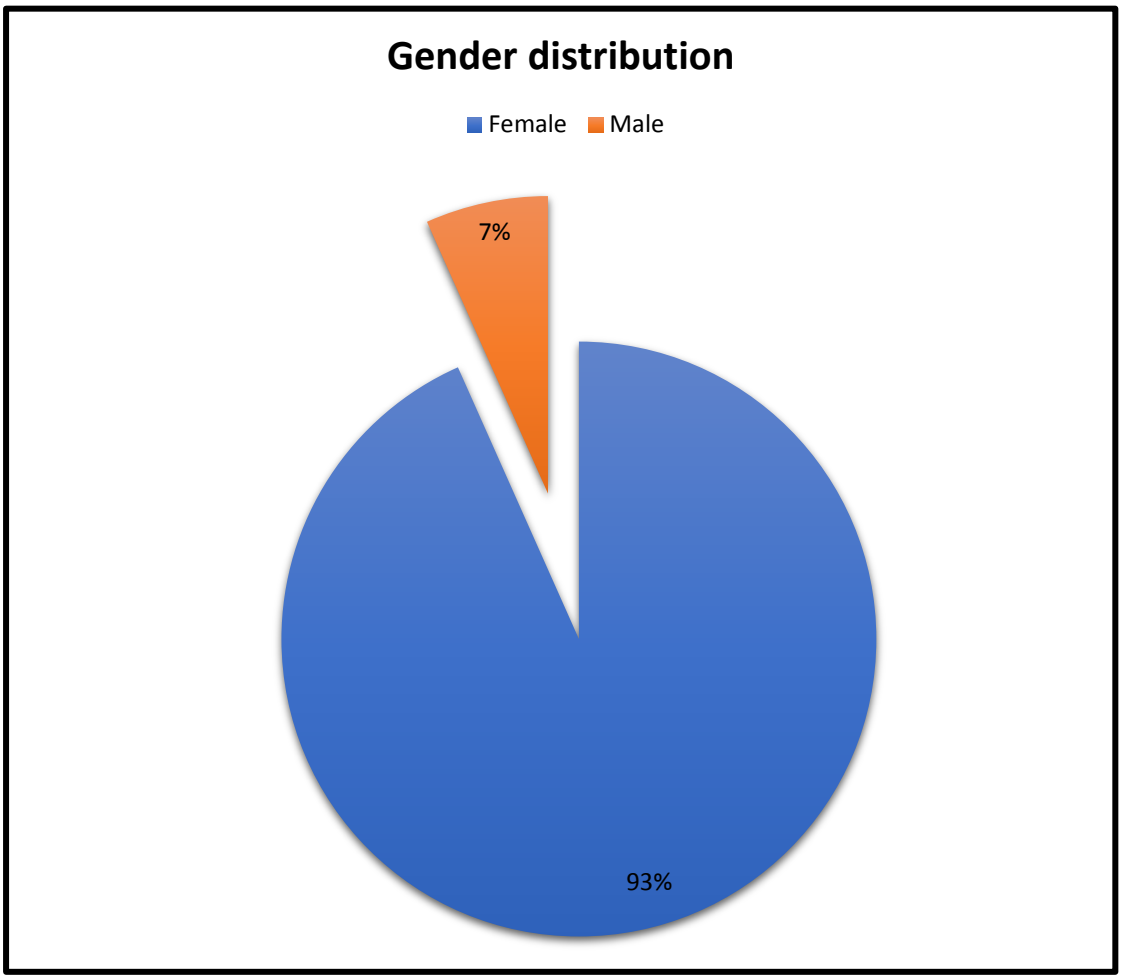
Age distribution		
	Frequency	Percent
Upto 30 yrs	14	23.3
31 - 40 yrs	15	25.0
41 - 50 yrs	17	28.3
51 - 60 yrs	13	21.7
Above 60 yrs	1	1.7
Total	60	100.0



The above table shows Age distribution were <30 years is 23.3%, 31-40 years is 25.0%, 41-50 years is 28.3%, 51-60 years is 21.7%, >60 years is 1.7%.

Table 2: Gender distribution

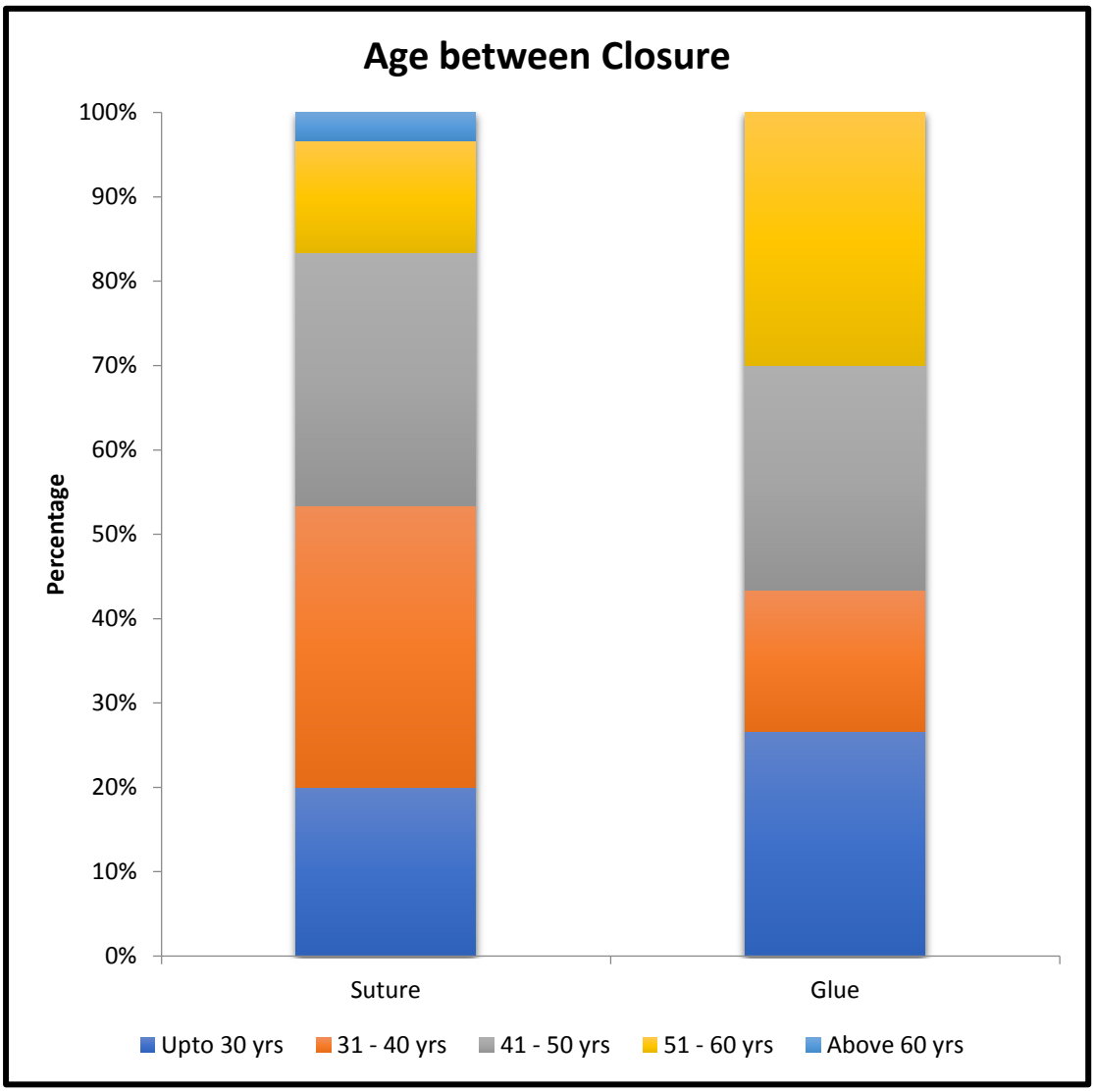
Gender distribution		
	Frequency	Percent
Female	56	93.3
Male	4	6.7
Total	60	100.0



The above table shows Gender distribution were Female is 93.3%, Male is 6.7%.

Table 3:Comparison of Age between the Closure by Pearson's Chi-Square test

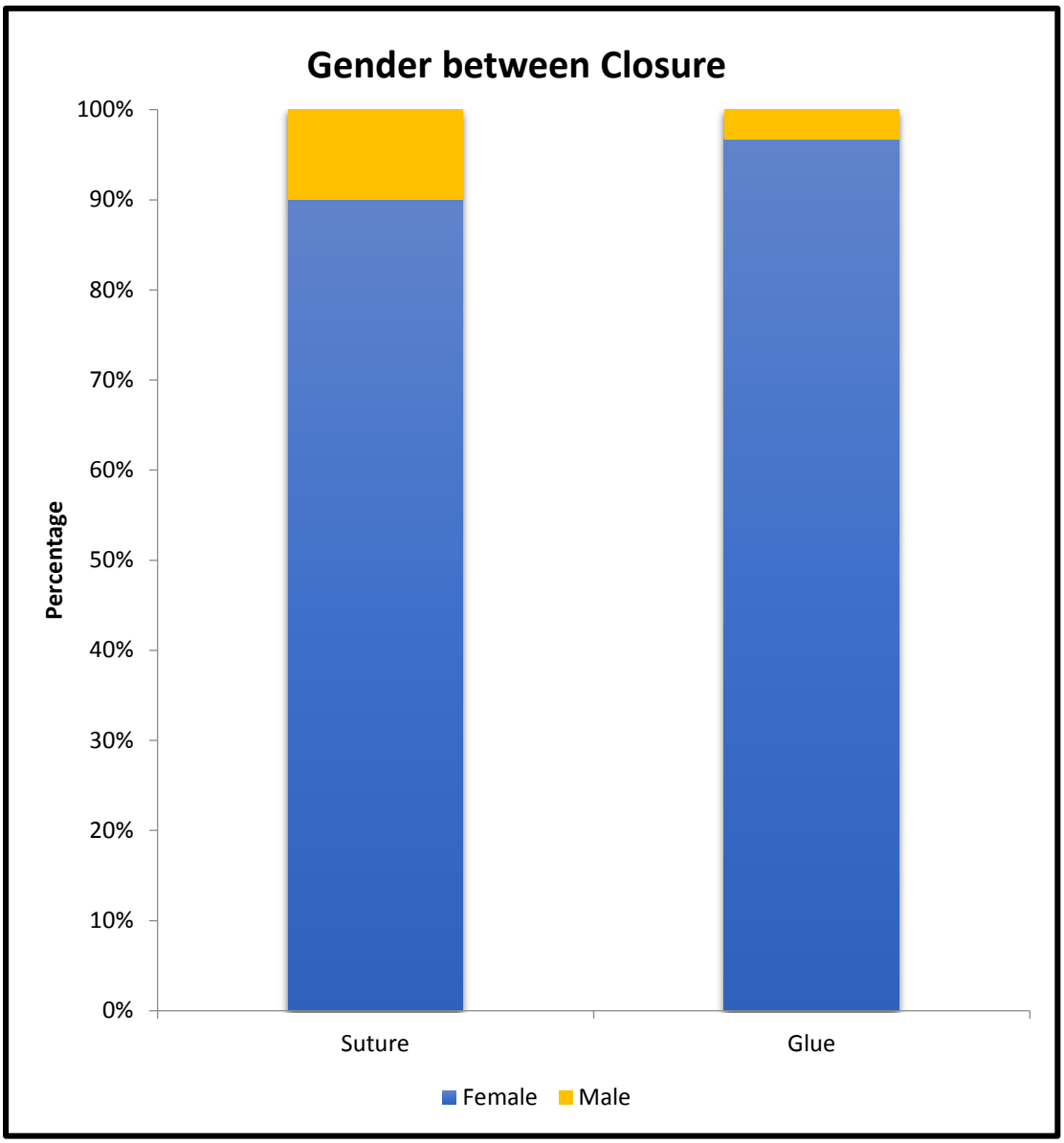
			Closure		Total	$\chi 2$ - value	p-value
			Suture	Glue			
Age	Upto 30 yrs	Count	6	8	14	4.934	0.294 #
		%	20.0%	26.7%	23.3%		
	31 - 40 yrs	Count	10	5	15		
		%	33.3%	16.7%	25.0%		
	41 - 50 yrs	Count	9	8	17		
		%	30.0%	26.7%	28.3%		
	51 - 60 yrs	Count	4	9	13		
		%	13.3%	30.0%	21.7%		
	Above 60 yrs	Count	1	0	1		
		%	3.3%	0.0%	1.7%		
Total		Count	30	30	60		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level							



The above table shows comparison of Age between Closure by Pearson's Chi-Square test were $\chi 2=4.934$, $p=0.294>0.05$ which shows no statistical significance between Age and Closure.

Table 4: Comparison of Gender between the Closure by Fisher's exact test

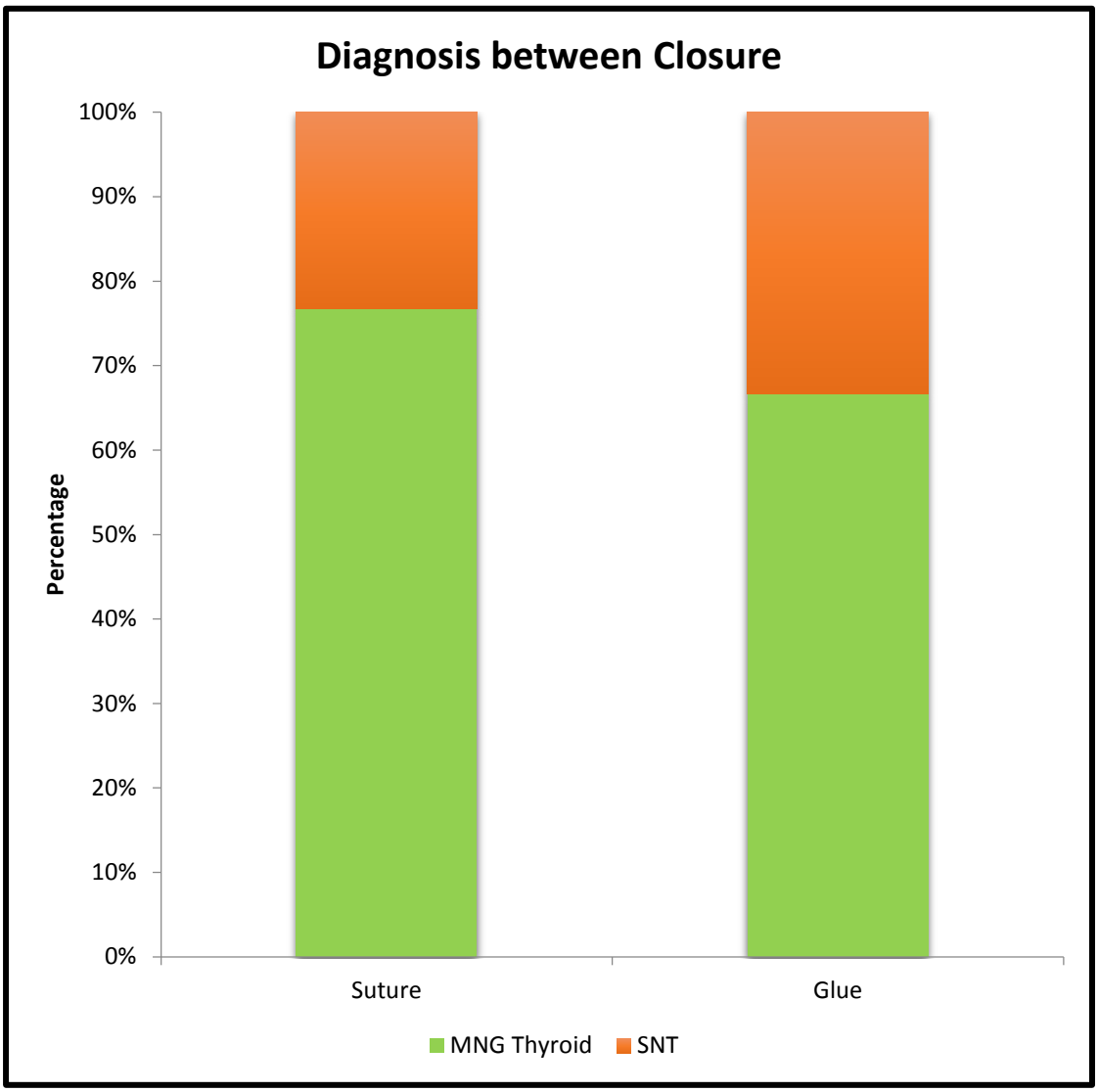
			Closure		Total	$\chi 2$ - value	p-value
			Suture	Glue			
Gender	Female	Count	27	29	56	1.071	0.612 #
		%	90.0%	96.7%	93.3%		
	Male	Count	3	1	4		
		%	10.0%	3.3%	6.7%		
Total		Count	30	30	60		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level							


Gender between Closure
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage
Suture
Glue
Female
Male

The above table shows comparison of Gender between Closure by Fisher's exact test were $\chi 2=1.071$, $p=0.612>0.05$ which shows no statistical significance between Gender and Closure.

Table 5:Comparison of Diagnosis between the Closure by Pearson's Chi-Square test

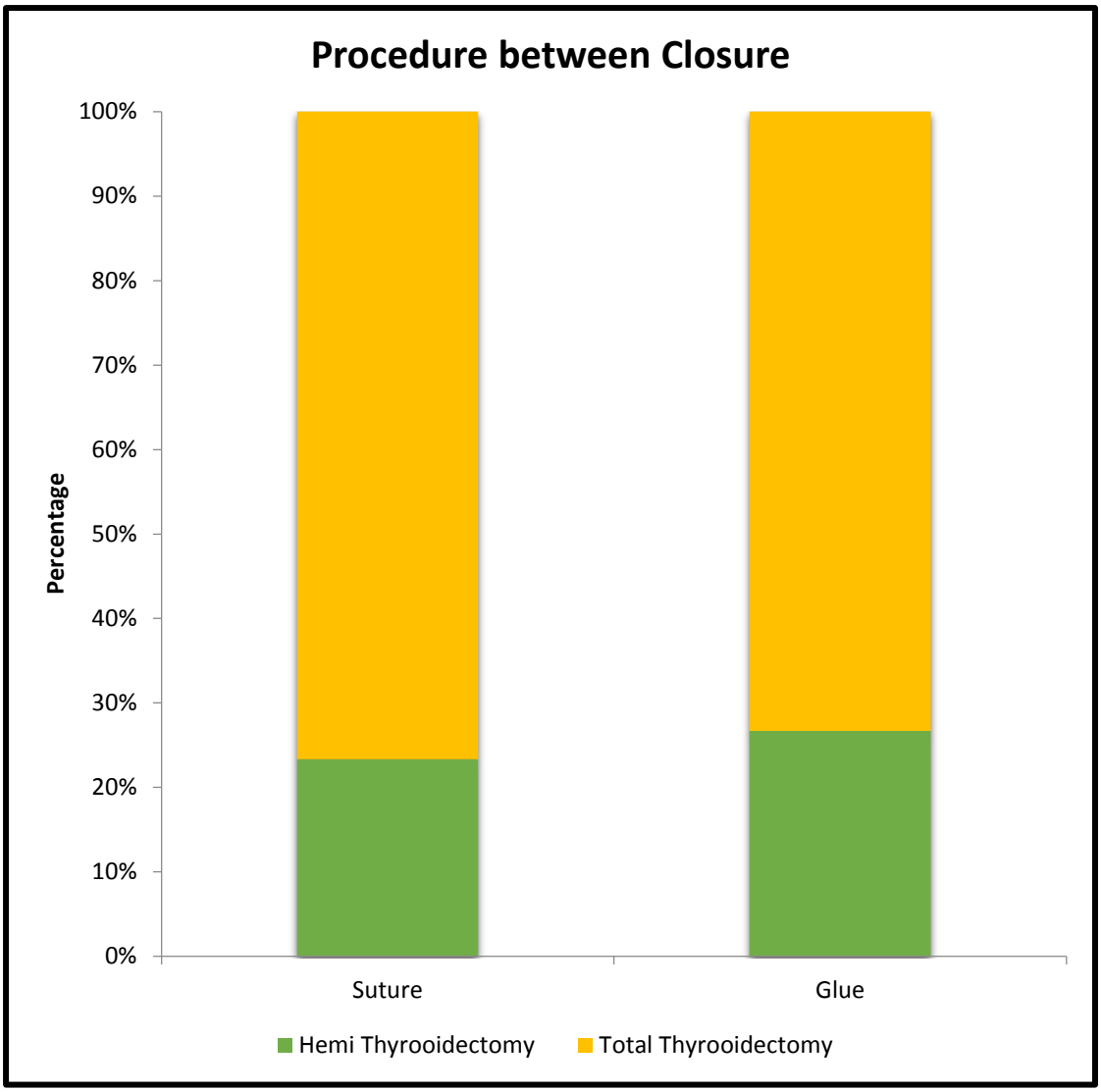
			Closure		Total	$\chi 2$ - value	p-value
			Suture	Glue			
Diagnosis	MNG Thyroid	Count	23	20	43	0.739	0.390 #
		%	76.7%	66.7%	71.7%		
	SNT	Count	7	10	17		
		%	23.3%	33.3%	28.3%		
Total		Count	30	30	60		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level							



The above table shows comparison of Diagnosis between Closure by Pearson's Chi-Square test were $\chi 2=0.739$, $p=0.390>0.05$ which shows no statistical significance between Diagnosis and Closure.

Table 6:Comparison of Procedure between the Closure by Pearson's Chi-Square test

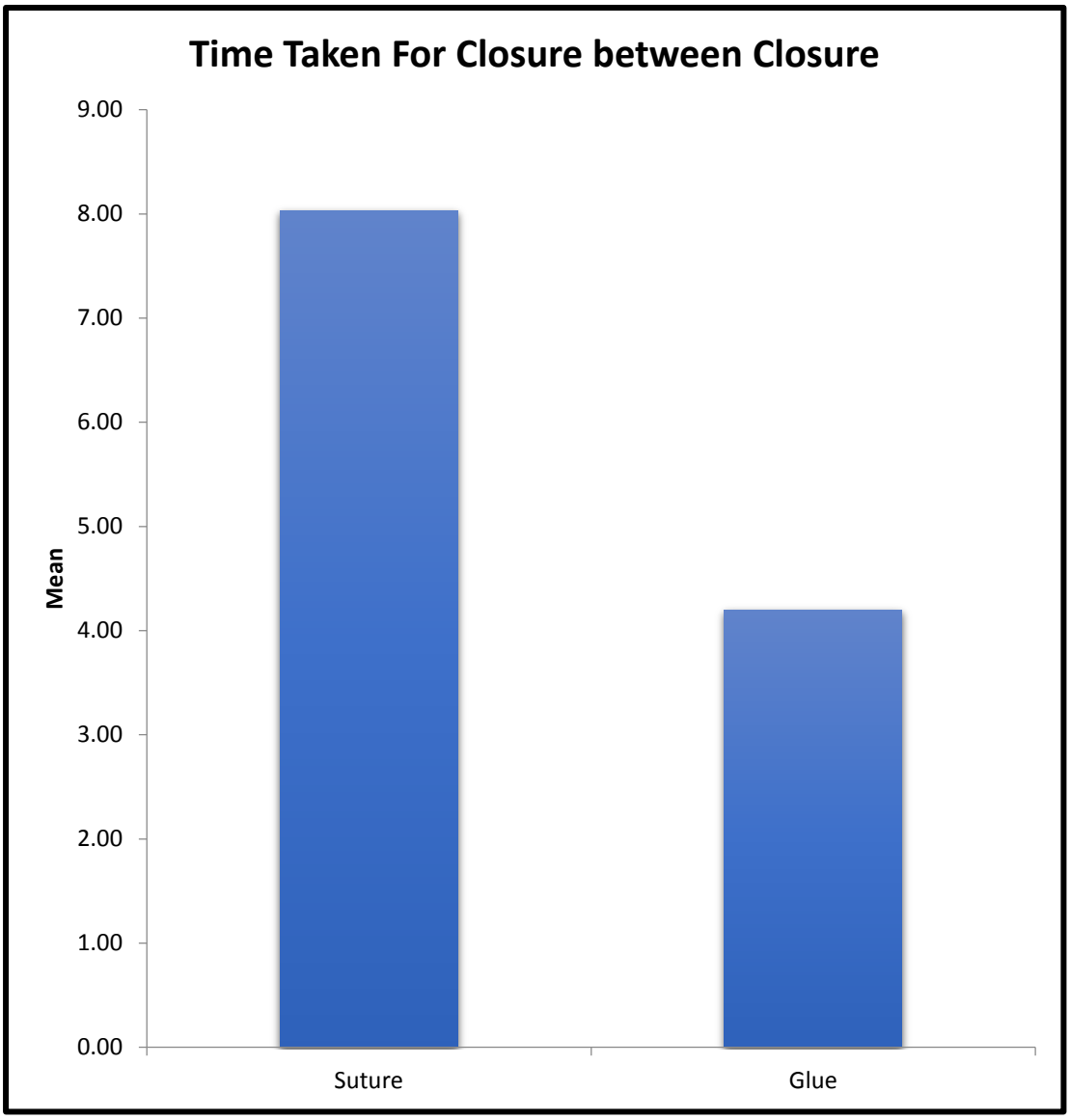
			Closure		Total	χ^2 - value	p-value
			Suture	Glue			
Procedure	Hemi Thyroidectomy	Count	7	8	15	0.089	0.766 #
		%	23.3%	26.7%	25.0%		
	Total Thyroidectomy	Count	23	22	45		
		%	76.7%	73.3%	75.0%		
Total		Count	30	30	60		
		%	100.0 %	100.0 %	100.0 %		
# No Statistical Significance at p > 0.05 level							



The above table shows comparison of Procedure between Closure by Pearson's Chi-Square test were $\chi 2=0.089$, $p=0.766>0.05$ which shows no statistical significance between Procedure and Closure.

Table 7:Comparison of Time Taken for Closure between the Closure by Unpaired sample t-test

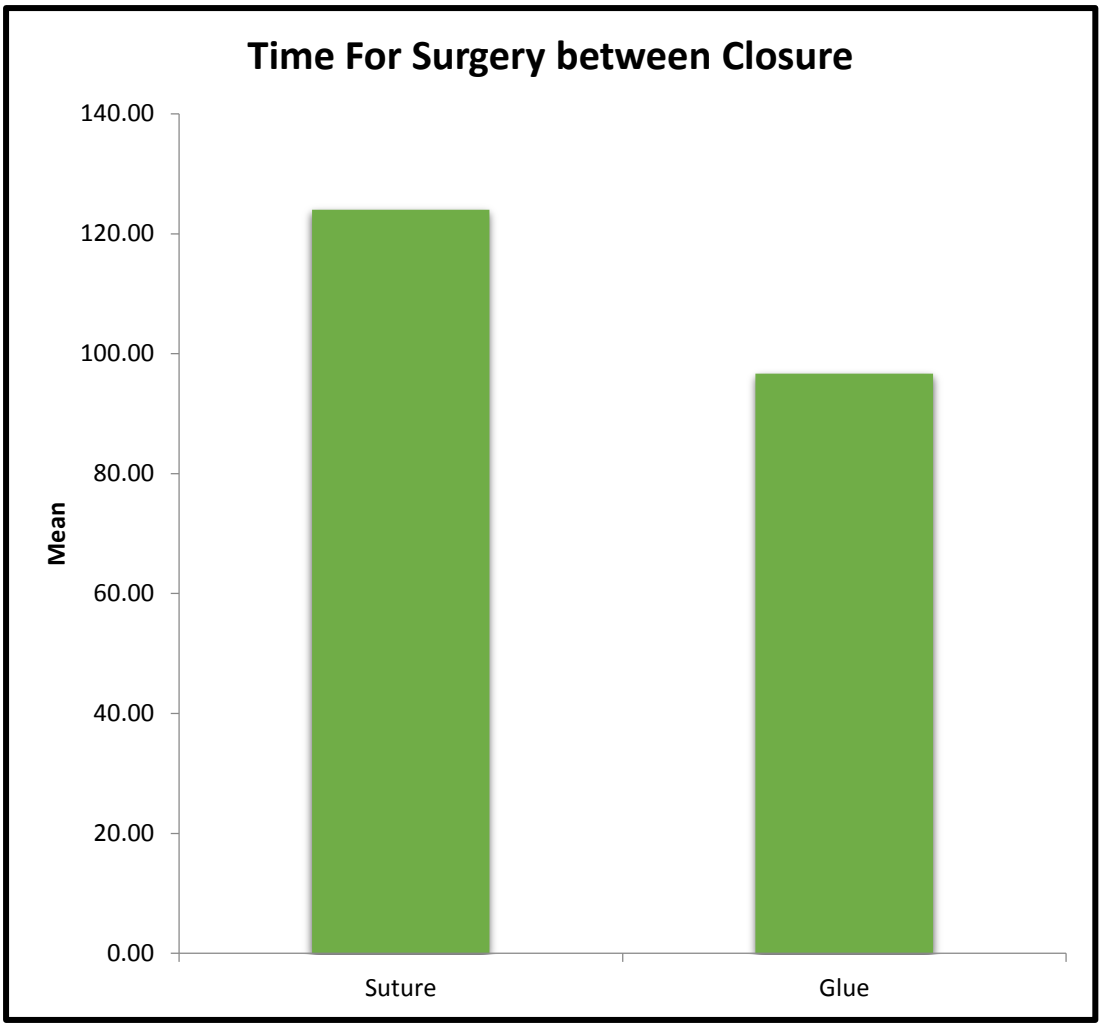
Variable	Closure	N	Mean	SD	t-value	p-value
Time Taken For Closure	Suture	30	8.03	1.07	15.141	0.0005 **
	Glue	30	4.20	0.89		
** Highly Statistical Significance at p < 0.01 level						



The above table shows comparison of Time Taken for Closure between Closure by Unpaired t-test were t-value=15.141, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

Table 8:Comparison of Time For Surgery between the Closure by Unpaired sample t-test

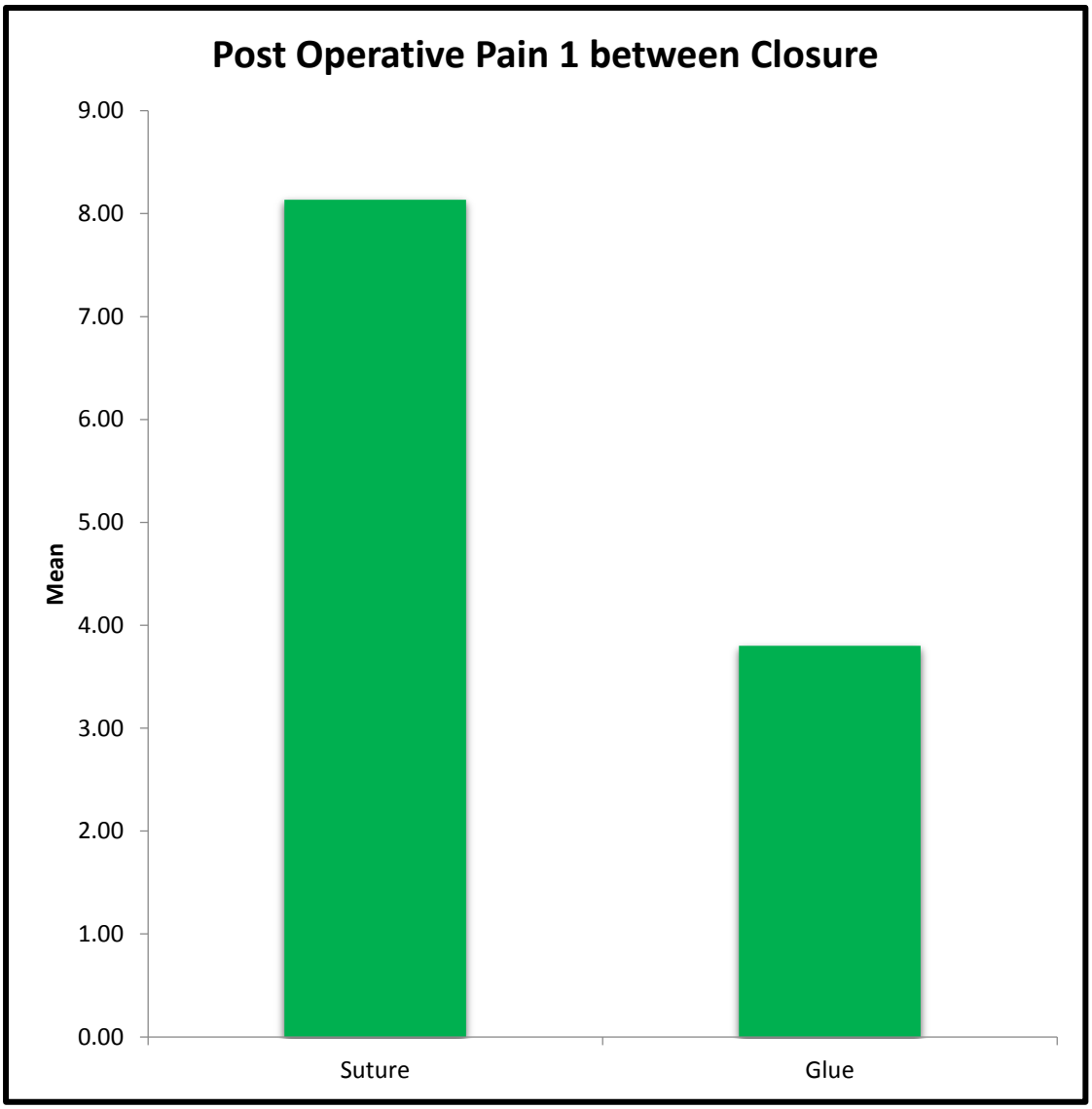
Variable	Closure	N	Mean	SD	t-value	p-value
Time For Surgery	Suture	30	124.00	23.58	5.813	0.0005 **
	Glue	30	96.67	10.37		
** Highly Statistical Significance at p < 0.01 level						



The above table shows comparison of Time For Surgery between Closure by Unpaired t-test were t-value=5.813, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

Table 9:Comparison of Post Operative Pain1 between the Closure by Unpaired sample t-test

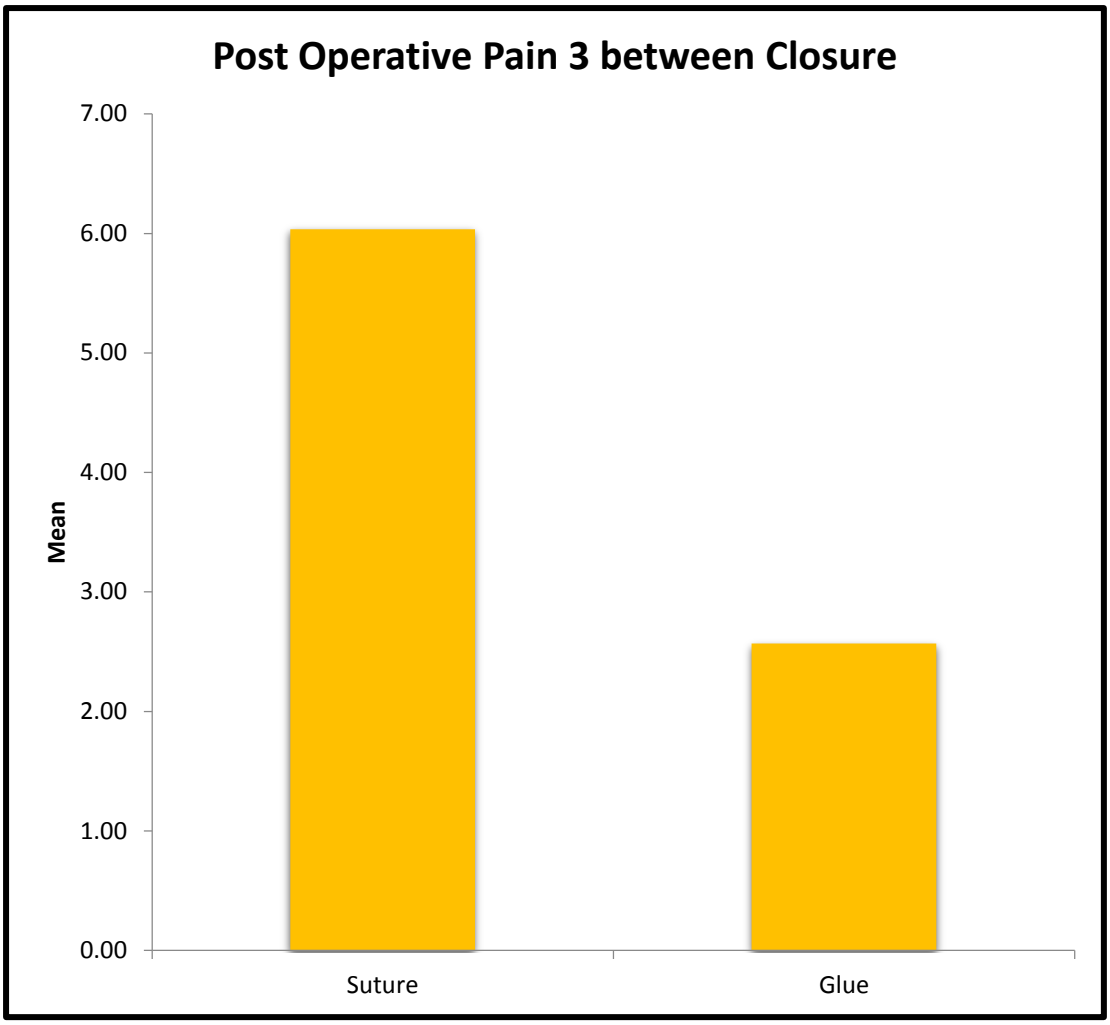
Variable	Closure	N	Mean	SD	t-value	p-value
Post Operative Pain1	Suture	30	8.13	0.68	22.501	0.0005 **
	Glue	30	3.80	0.81		
** Highly Statistical Significance at p < 0.01 level						



The above table shows comparison of Post Operative Pain1 between Closure by Unpaired t-test were t-value=22.501, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

Table 10:Comparison of Post Operative Pain 3 between the Closure by Unpaired sample t-test

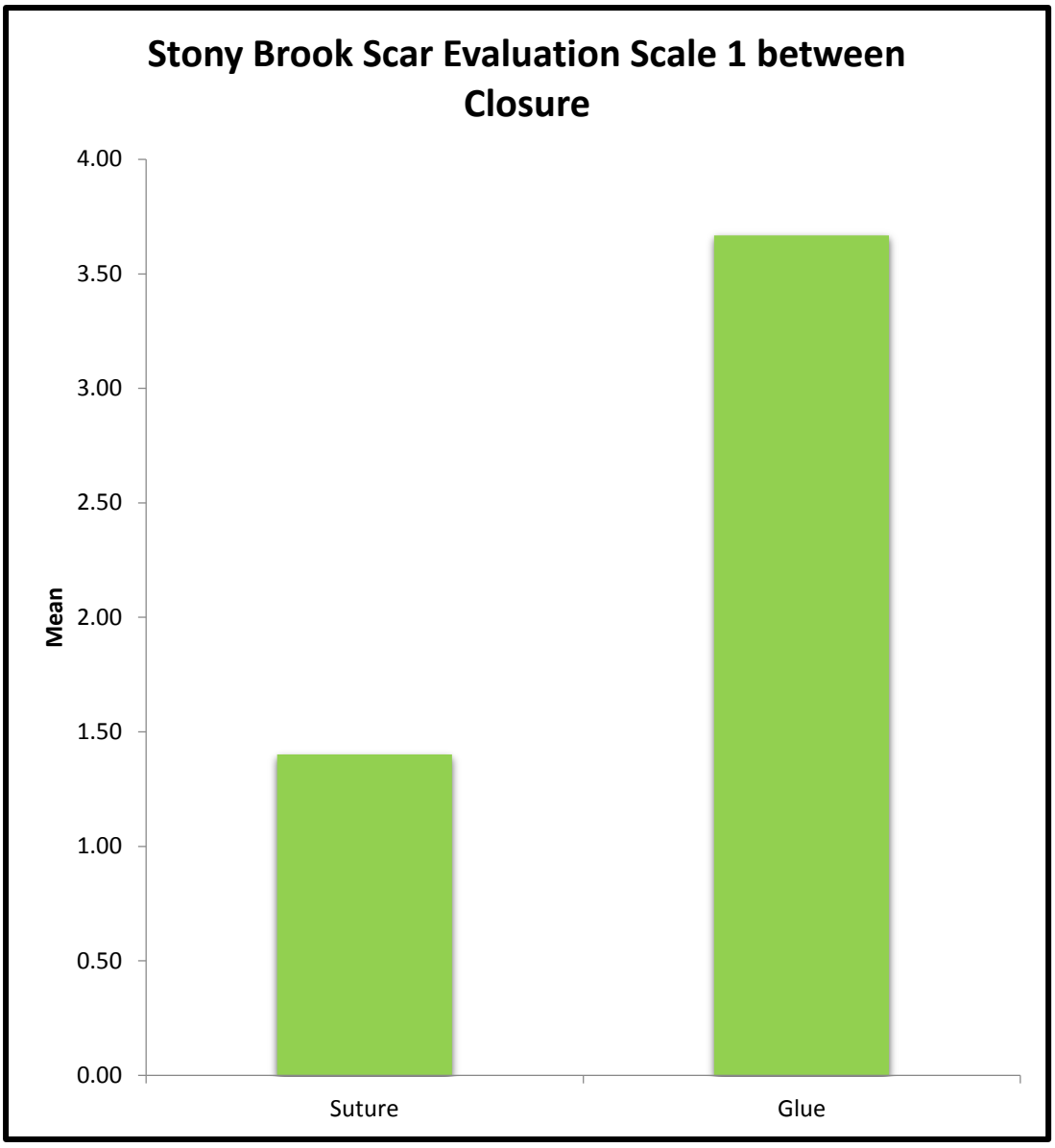
Variable	Closure	N	Mean	SD	t-value	p-value
Post Operative Pain 3	Suture	30	6.03	1.16	14.135	0.0005 **
	Glue	30	2.57	0.68		
** Highly Statistical Significance at p < 0.01 level						



The above table shows comparison of Post Operative Pain 3 between Closure by Unpaired t-test were t-value=14.135, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

Table 11:Comparison of Stony Brook Scar Evaluation Scale 1 between the Closure by Unpaired sample t-test

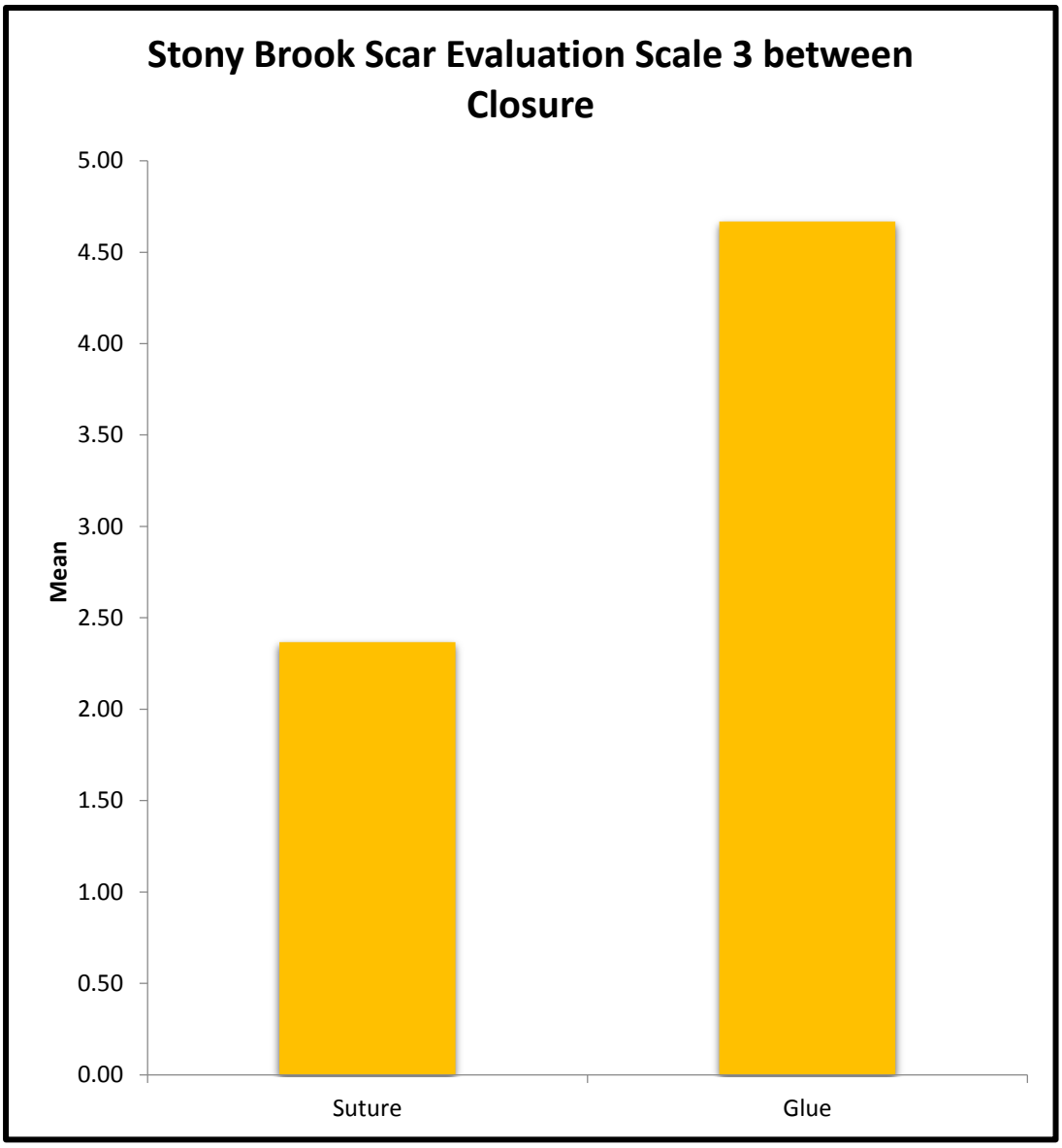
Variable	Closure	N	Mean	SD	t-value	p-value
Stony Brook Scar Evaluation Scale1	Suture	30	1.40	0.50	17.954	0.0005 **
	Glue	30	3.67	0.48		
** Highly Statistical Significance at p < 0.01 level						



The above table shows comparison of Stony Brook Scar Evaluation Scale1 between Closure by Unpaired t-test were t-value=17.954, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

Table 12:Comparison of Stony Brook Scar Evaluation Scale 3 between the Closure by Unpaired sample t-test

Variable	Closure	N	Mean	SD	t-value	p-value
Stony Brook Scar Evaluation Scale3	Suture	30	2.37	0.49	18.373	0.0005**
	Glue	30	4.67	0.48		
** Highly Statistical Significance at p < 0.01 level						



The above table shows comparison of Stony Brook Scar Evaluation Scale 3 between Closure by Unpaired t-test were t-value=18.373, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

SUMMARY

- The Age distribution were <30 years is 23.3%, 31-40 years is 25.0%, 41-50 years is 28.3%, 51-60 years is 21.7%, >60 years is 1.7%.

- The Gender distribution were Female is 93.3%, Male is 6.7%.

- The Age between Closure by Pearson's Chi-Square test were $\chi 2=4.934$, $p=0.294>0.05$ which shows no statistical significance between Age and Closure.

- The Gender between Closure by Fisher's exact test were $\chi 2=1.071$, $p=0.612>0.05$ which shows no statistical significance between Gender and Closure.

- The Diagnosis between Closure by Pearson's Chi-Square test were $\chi 2=0.739$, $p=0.390>0.05$ which shows no statistical significance between Diagnosis and Closure.

- The Procedure between Closure by Pearson's Chi-Square test were $\chi 2=0.089$, $p=0.766>0.05$ which shows no statistical significance between Procedure and Closure.

- The Time Taken for Closure between Closure by Unpaired t-test were t-value=15.141, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

- The Time for Surgery between Closure by Unpaired t-test were t-value=5.813, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

- The Post Operative Pain1 between Closure by Unpaired t-test were t-value=22.501, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

- The Post Operative Pain 3 between Closure by Unpaired t-test were t-value=14.135, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

- The Stony Brook Scar Evaluation Scale1 between Closure by Unpaired t-test were t-value=17.954, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

- The Stony Brook Scar Evaluation Scale 3 between Closure by Unpaired t-test were t-value=18.373, p-value=0.0005<0.01 which shows highly statistical significance difference at $p < 0.01$ level.

DISCUSSION

The main goal of all wound closure techniques is to approximate the edge of the wound without interfering the natural healing process. Traditionally, skin closure technique was performed with suture material because of cost-effectiveness and availability. But current trend runs towards a faster, comfortable and cosmetically better technique. Suture material remains standard material for skin closure, but however use of suture material is associated with postoperative pain and one have to come for suture removal which in turn causes anxiety or pain. Since suture material is associated with puncture site near the wound edge, there is high chance of microbial invasion which in turn leads on to surgical site infection.

Needle stick injury is highly associated with suture material and hence there is high chance of transmission of HIV and other diseases. Despite all shortcomings of suture material technique, it still retains the maximum tensile strength.

Again coming onto stapler device, application is faster, associated with lowest rate of tissue reaction and infection. However these stapler device do not produce meticulous closure and removal of stapler produces pain.

Surgical tapes which is used for wound closure technique is least inducers of tissue reactivity but however it requires the use of adhesive adjuncts like tincture of benzoin which increases the local induration and skin toxicity. An ever-ending research for a material to overcome the shortcomings of various closure technique led to discovery of skin adhesive glue (octylcyanoacrylate).

Tissue adhesive were discovered in 1949 but clinically it came into surgeons practice in 1959. In earlier generation short carbon atoms were used which results in faster degradation and producing toxic products. cyanoacrylate are topical adhesive glues that forms bond over outer surface of skin. It contains long chain plascticizer and forms strong flexible bond.

TIME TAKEN FOR SKIN CLOSURE:

In one of the published studies of 2-octylcyanoacrylate of quin.J.et al, use of adhesive glue was found to be significantly faster (220 seconds versus 744 seconds ; $p<0.001$). In MATIN.S.F study, the mean time taken for skin closure in adhesive glue group is faster than skin suturing group (150 seconds versus 360 seconds). In the present study, the mean time taken for skin closure is studied in minutes. The mean time taken for adhesive glue is 4.20 minutes ±1.53 and for skin suturing group the mean time taken is 8.03 minutes ±1.32. This difference in minimum time taken of skin closure for adhesive group if great significant with p value <0.001.

POSTOPERATIVE PAIN :

The postoperative pain for both skin glue and skin suturing is compared at 1st week and 3rd week of postoperative day. Postoperative pain is assessed using visual analogue scale. In the present study it is observed that postoperative pain is less. several studies such as Quin.J. et al have compared postoperative pain and shown that less postoperative pain in adhesive glue group but of no significance. In the present study it is seen that postoperative is less with skin glue group than with suturing

techniques. This difference is of great significance with p value <0.001.

POSTOPERATIVE SCAR:

Postoperative scar following skin closure with adhesive glue and skin suturing is studied using stony brook scar evaluation score. The SBSES has five parameters like width of the scar, Height of the scar, color, Hatch marks/suture marks and overall appearance . Score ranges from 0 (worst) to 5 (best). In the present study it is observed that hyperpigmentation with increased scar height and band like texture is associated with skin suturing group.

Adhesive glue group is associated with less pigmentation, normal skin colour and pliable skin. The difference is of great significance with p value <0.001.

CONCLUSION

This study was conducted to compare skin closure techniques with tissue adhesives and skin sutures. The concept of tissue adhesive is superior to skin suture due to the following properties:

1. Faster, comfortable and cosmetically better.

2. Time taken for skin closure is shorter which in turn reduces operating time.

3. It provides flexible, water resistant and sealed skin closure.

4. It forms water tight barrier and allows the patient to take shower at any time.

5. Stitches need not be removed.

6. No need to apply bandages.

7. Reduced postoperative pain.

8. It disappears naturally as incision heals and leaves no mark.

9. It is non- irritant and can be safely applied.

Therefore it is concluded that Octyl cyanoacrylate can be used in surgical skin closure in clean elective surgeries.

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PROFORMA

Name:	I. P. No:
Age: -	Unit:
Sex: -	D.O.A:
Occupation: -	D.O.D:
Address: -	D.O.S
Ph NO:	

CHIEF COMPLAINTS:

1) Swelling

2) Other complaints

HISTORY OF PRESENTING ILLNESS:

- Features Of

o Hyperthyroidism

o Hypothyroidism

o Euthyroid

- Other History:

PAST HISTORY

1) History of previous surgeries

2) History suggestive of Hypertension/ Diabetes/ Tuberculosis/ asthma/ Immuno-suppressive disorders.

FAMILY HISTORY

Similar illness in other family members

GENERAL PHYSICAL EXAMINATION

1. General survey

2. Body build and nourishment

3. Height

4. weights

5. Dehydration:mild/moderate/severe/Nil

6. Anemia/Jaundice/Clubbing/cyanosis/Lymphadenopathy/pedal edema

7. Pulse

8. Temperature

9. Respiratory Rate

10. Blood pressure

CLINICAL DIAGNOSIS

1.Hb

2.TLC

3.DLC

4.BT

5. CT

6. ESR

7. Blood group and Rh type

8. Urine: Albumin/ Sugar/ Microscopy

9. Chest x-ray

10. HIV

11. USG Neck:

12. FNAC:

13. TSH:

14. T3:

15. T4:

FINAL DIAGNOSIS:

Surgery Done:

Intra Operative Findings:

Skin Closure Material:

Biopsy Report:

FOLLOW UP:

1. post operative pain using visual analog scale

2. post operative scar using stony brook scar evaluation score

INFERENCE:

INFORMATION SHEET

A COMPARATIVE STUDY OF 2-OCTYLCYANOACRYLATE TISSUE ADHESIVE GLUE WITH SUTURE MATERIAL (3-0 MONOCRYL SUBCUTICULAR SUTURE) FOR SKIN CLOSURE IN THYROIDECTOMY AT RGGGH, CHENNAI

Name of Investigator: Dr. DEVI. T .

Name of Participant:

Purpose of Research: To study the efficacy of tissue adhesive glue and subcuticular suture material (3-0 monocryl) thereby reducing operating time, decreasing postoperative pain and less scar .

Study Design : Prospective Study

Study Procedures: Patient will be divided into two groups Group 1 and Group2.

Subcuticular Suture and tissue adhesive glues will be applied respectively. Two groups will be monitored for time required for skin closure, postoperative pain and post operative scar and data analyzed.

Possible Risks: No risks to the patient

Possible benefits

To patient : Since adhesive glue came into clinical practice which have less post operative pain ,better cosmesis and less wound infection patient may be benefited with outcome.

To doctor & to other people : Based on outcome monitored, suture techniques which have less post-operative pain , less infection and reduced time requirement , good scar and better cosmesis will be very helpful .

Confidentiality of the information obtained from you : The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared

Can you decide to stop participating in the study : Taking part in this study is

Voluntary. You are free to decide whether to participate in this study or to withdraw at any time

How will your decision to not participate in the study affect you : Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator Signature of Participant

Date : Place :

ஆராய்ச்சி தகவல் அறிக்கை

இராஜீவ்காந்தி அரசு பொது மருத்துவமனைக்கு வரும் நோயாளிக்குள் தைராய்டு அறுவை சிகிச்சை செய்து கொள்பவர்களுக்கு ஒரு ஆராய்ச்சி நடைபெற்று வருகிறது. நீங்களும் இந்த ஆராய்ச்சியில் பங்கேற்க விரும்புகிறோம். உங்களை சில சிறப்பு பரிசோதனைக்கு உட்படுத்தி அதன் தகவல்களை ஆராய்வோம். அதனால் தங்களது நோயின் ஆய்வரிக்கையோ அல்லது சிகிச்சையோ பாதிப்பு ஏற்படாது என்பதை தெரிவித்து கொள்கிறேன் முடிவுகளை வெளியிடும்போது அல்லது ஆராய்ச்சியின்போது தங்களது பெயரோ அல்லது அடையாளங்களோ வெளியிடமாட்டோம் என்பதை தெரிவித்துக்கொள்கிறோம். இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய விருப்பத்தின் பேரில்தான் நடக்கும். மேலும் நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சியில் இருந்து பின்வாங்கலாம் என்பதையும் தெரிவித்துக்கொள்கிறோம். இந்த பரிசோதனையின் முடிவுகளை ஆராய்ச்சியின்போது அல்லது ஆராய்ச்சியின் முடிவின்போது தங்களுக்கு அறிவிப்போம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

ஆராய்ச்சியாளரின் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

MASTER CHART

S.NO	NAME	AGE	SEX	IP NO	DIAGNOSIS	PROCEDURE	TIME TAKEN FOR CLOSURE	POST OPERATIVE PAIN		STONY BROOK SCAR EVALUATION SCALE		CLOSURE	TIME FOR SURGERY
1	LAKSHMI	36	F	53582	MNG THYROID	TOTAL THYROIDECTOMY	8	8	7	1	2	SUTURE	1hr 30min
2	SIVARANJINI	29	F	595238	SNT	HEMI THYROIDECTOMY	5	5	4	3	4	GLUE	1hr40min
3	PADMA	45	F	13062	MNG THYROID	TOTAL THYROIDECTOMY	10	8	6	1	2	SUTURE	2hr10min
4	MANJU	48	F	1533	MNG THYROID	TOTAL THYROIDECTOMY	4	4	3	3	4	GLUE	1hr30min
5	CHITRA	47	F	18359	MNG THYROID	TOTAL THYROIDECTOMY	9	9	8	2	2	SUTURE	1hr50min
6	KARPAGAM	44	F	126916	MNG THYROID	TOTAL THYROIDECTOMY	5	3	2	4	5	GLUE	1hr45min
7	LAKSHMI	43	F	126690	MNG THYROID	TOTAL THYROIDECTOMY	10	8	5	2	2	SUTURE	1hr50min
8	VALARMATHY	30	F	125167	SNT	HEMI THYROIDECTOMY	5	3	2	3	4	GLUE	1hr55min
9	MALLI	45	F	111809	MNG THYROID	TOTAL THYROIDECTOMY	9	9	8	1	2	SUTURE	2hr30min
10	ANITHA	28	F	111142	SNT	HEMI THYROIDECTOMY	4	5	2	4	4	GLUE	1hr30min
11	CHINNASAMY	57	M	71043	MNG THYROID	TOTAL THYROIDECTOMY	9	9	7	2	3	SUTURE	1hr45min
12	YASODHA	56	F	30043	MNG THYROID	TOTAL THYROIDECTOMY	4	4	2	4	5	GLUE	1hr30min
13	RAJENDRAN	42	M	5727	MNG THYROID	TOTAL THYROIDECTOMY	8	8	7	1	2	SUTURE	1hr55min
14	THANGAMNI	20	F	13628	SNT	HEMI THYROIDECTOMY	3	5	4	4	5	GLUE	1hr45min
15	KURSHID	27	F	15600	SNT	HEMI THYROIDECTOMY	7	8	7	1	3	SUTURE	2hr30min
16	PUNITHA	44	F	14320	MNG THYROID	TOTAL THYROIDECTOMY	4	4	2	3	4	GLUE	1hr30min
17	SHANTHI	36	F	2290	SNT	HEMI THYROIDECTOMY	6	8	5	1	2	SUTURE	1hr45min
18	MUNIAMMAL	51	F	1361	MNG THYROID	TOTAL THYROIDECTOMY	4	4	3	3	5	GLUE	1hr45min
19	DEVI	30	F	124065	SNT	HEMI THYROIDECTOMY	7	7	5	2	3	SUTURE	1hr55min
20	KRISHNAVENI	55	F	115831	MNG THYROID	TOTAL THYROIDECTOMY	4	2	4	4	5	GLUE	1hr30min

21	RASATHI	34	F	11273	SNT	HEMI THYROIDECTOMY	9	8	7	1	2	SUTURE	1hr55min	
22	LAKSHMI	53	F	103643	MNG THYROID	TOTAL THYROIDECTOMY	5	5	2	4	5	GLUE	1hr45min	
23	KUPPU	45	F	10743	MNG THYROID	TOTAL THYROIDECTOMY	8	9	6	1	2	SUTURE	2hr45min	
24	SANGEETHA	35	F	105170	SNT	HEMI THYROIDECTOMY	5	3	2	4	5	GLUE	1hr55min	
25	KANIMOZHI	30	F	104160	SNT	HEMI THYROIDECTOMY	8	9	8	2	3	SUTURE	1hr30min	
26	RAJASEKRAN	58	M	96902	MNG THYROID	TOTAL THYROIDECTOMY	6	4	3	3	4	GLUE	1hr20min	
27	VASANTH	20	F	98954	SNT	HEMI THYROIDECTOMY	8	8	5	2	3	SUTURE	2hr15min	
28	DHANALAKSHMI	24	F	74763	MNG THYROID	TOTAL THYROIDECTOMY	4	3	2	3	4	GLUE	1hr45min	
29	MANJULA	48	F	48330	MNG THYROID	TOTAL THYROIDECTOMY	8	8	5	2	3	SUTURE	1hr55min	
30	STELLA	53	F	59240	MNG THYROID	TOTAL THYROIDECTOMY	5	4	3	3	4	GLUE	1hr30min	
31	MANISHA	40	F	61713	MNG THYROID	TOTAL THYROIDECTOMY	9	8	5	1	2	SUTURE	1hr45min	
32	KAMALA	45	F	53020	MNG THYROID	TOTAL THYROIDECTOMY	3	3	2	4	5	GLUE	1hr30min	
33	MUNILAKSHMI	67	F	50531	MNG THYROID	TOTAL THYROIDECTOMY	8	7	8	1	2	SUTURE	2hr15min	
34	SELVAMANI	40	F	52544	MNG THYROID	TOTAL THYROIDECTOMY	4	4	3	4	5	GLUE	1hr40min	
35	VINCENT	59	M	18661	MNG THYROID	TOTAL THYROIDECTOMY	8	9	6	1	2	SUTURE	1hr30min	
36	VENDA	41	F	30060	MNG THYROID	TOTAL THYROIDECTOMY	3	3	2	4	5	GLUE	1hr15min	
37	DIVYA	29	F	32777	SNT	HEMI THYROIDECTOMY	7	9	5	2	3	SUTURE	1hr45min	
38	UMA	54	F	50445	MNG THYROID	TOTAL THYROIDECTOMY	4	3	2	3	4	GLUE	1hr35min	
39	RAJESHWARI	35	F	50396	MNG THYROID	TOTAL THYROIDECTOMY	8	8	7	1	2	SUTURE	1hr45min	
40	RITA JESY	41	F	50559	SNT	HEMI THYROIDECTOMY	4	5	3	4	5	GLUE	1hr35min	
41	JANAKI	34	F	50396	MNG THYROID	TOTAL THYROIDECTOMY	7	8	5	1	2	SUTURE	1hr55min	
42	VINODHA	40	F	50676	MNG THYROID	TOTAL THYROIDECTOMY	6	5	3	3	4	GLUE	1hr45min	
43	JASEEMA	39	F	519922	MNG THYROID	TOTAL THYROIDECTOMY	5	8	5	1	2	SUTURE	2hr10min	
44	PREETHA	29	F	53638	SNT	HEMI THYROIDECTOMY	4	4	3	4	5	GLUE	1hr30min	
45	LALITHA	31	F	53642	MNG THYROID	TOTAL THYROIDECTOMY	8	8	6	1	2	SUTURE	2hr40min	
46	KEERTHI	29	F	55972	SNT	TOTAL THYROIDECTOMY	6	4	3	4	5	GLUE	1hr40min	

47	ESAKIYAMMAL	54	F	55907	MNG THYROID	TOTAL THYROIDECTOMY	8	9	5	1	2	SUTURE	2hr45min
48	POOJA	33	F	56028	MNG THYROID	TOTAL THYROIDECTOMY	4	4	3	4	5	GLUE	1hr45min
49	PARAMESWARI	50	F	55945	MNG THYROID	TOTAL THYROIDECTOMY	9	8	4	2	3	SUTURE	1hr55min
50	KOKILA	49	F	58511	MNG THYROID	TOTAL THYROIDECTOMY	3	4	2	4	5	GLUE	1hr35min
51	NANDHINI	30	F	58650	MNG THYROID	TOTAL THYROIDECTOMY	8	6	5	2	3	SUTURE	1hr55min
52	RAGHAVI	37	F	53632	SNT	TOTAL THYROIDECTOMY	3	3	2	4	5	GLUE	1hr25min
53	KAMALI	34	F	59512	MNG THYROID	TOTAL THYROIDECTOMY	7	8	6	2	3	SUTURE	1hr55min
54	JAMUNA	29	F	61217	SNT	HEMI THYROIDECTOMY	3	4	3	4	5	GLUE	1hr55min
55	YAZHINI	34	F	58583	MNG THYROID	TOTAL THYROIDECTOMY	8	8	7	1	2	SUTURE	2hr45min
56	SAROJA	54	F	66760	MNG THYROID	TOTAL THYROIDECTOMY	4	3	2	4	5	GLUE	1hr45min
57	MAHESHWARI	43	F	66750	MNG THYROID	TOTAL THYROIDECTOMY	9	8	6	2	3	SUTURE	2hr15min
58	RUKMANI	55	F	70180	MNG THYROID	TOTAL THYROIDECTOMY	4	4	2	4	5	GLUE	1hr25min
59	CHELLAMMAL	58	F	73145	MNG THYROID	TOTAL THYROIDECTOMY	8	8	5	1	2	SUTURE	2hr45min
60	KALASELVI	42	F	76171	MNG THYROID	TOTAL THYROIDECTOMY	4	3	2	4	5	GLUE	1hr25min

ABBREVATION:

RLN : RECURRENT LARYNGEAL NERVE

SSI : SURGICAL SITE INFECTION

OCA: OCTYLY CYANO ACRYLATE

SBSE: STONY BROOK SCAR EVALUATION

VAS : VISUAL ANALOGUE SCORE

Curiginal

Document Information

Analyzed document	A STUDY ON COMPARISON OF SUBCUTICULAR SUTURING AND TISSUE ADHESIVE -2-OCTYL CYANOACRYLATE FOR SKIN CLOSURE IN THYROIDECTOMY AT RGGGH, CHENNAI.docx (D123577960)
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CERTIFICATE – II

This is to certify that this dissertation work titled "**A STUDY ON COMPARISON OF SUBCUTICULAR SUTURING AND TISSUE ADHESIVE-2-OCTYL CYANOACRYLATE FOR SKIN CLOSURE IN THYROIDECTOMY AT RGGGH,CHENNAI"** of the candidate **Dr.DEVI.T,** with REGISTRATION NUMBER **221811004** for the award of **Master of Surgery (M.S) degree** in the branch of **GENERAL SURGERY**- Branch I. I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **23%** percentage of plagiarism in the dissertation.

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CERTIFICATE OF APPROVAL

To
Dr.**T.DEVI**
Post Graduate in General Surgery,
Institute of General Surgery,
Rajiv Gandhi Govt. General Hospital,
Madras Medical College,
Chennai-03.

Dear Dr. T.DEVI ,

The Institutional Ethics Committee has considered your request and approved your study titled **"A STUDY ON COMPARISON OF SUBCUTICULAR SUTURING AND TISSUE ADHESIVE-2-OCTYL CYANOACRYLATE FOR SKIN CLOSURE IN THYROIDECTOMY AT RGGGH. CHENNAI"-NO.11102019.** The following members of Ethics Committee were present in the meeting held on **01.10.2019** conducted at Madras Medical College, Chennai 3.

1. Prof.P.V.Jayashankar :Chairperson
2. Prof.R.Jayanthi,MD.,FRCP(Glasg)., Dean,MMC,Ch-3 :DeputyChairperson
3. Prof.N.Gopalakrishnan,MD.,DM.,FRCP, Vice Principal Director,Inst.of Nephrology,MMC,Ch : Member Secretary
4. Prof.Bharathi Vidya Jayanthi,Vice Principal Director,Inst. of Pathology,MMC,Ch- : Member
5. Prof.Ragunandhan,MD,Prof. Inst. of Int.Med,MMC, Ch-3 : Member
6. Prof.Alli, Prof. Inst. of Gen.Surgery,MMC : Member
7. Prof.Shobha, Prof, Inst.of O&G, Chennai : Member
8. Prof.Rema Chandramohan,Prof.of Paediatrics,ICH,Chennai : Member
9. Prof. Sudha, Prof. Inst. of Pharmacology,MMC,Ch-3 : Member
10. Prof.K.Ramadevi,MD., Director, Inst. of Bio-Chemistry,MMC,Ch-3 : Member
11. Prof. S.Lakshmi, Prof. of Paediatrics ICH Chennai : Member
12. Thiru S.Govindasamy, BA.,BL,High Court,Chennai : Lawyer
13. Tmt.Arnold Saulina, MA.,MSW., :Social Scientist
14. Thiru K.Ranjith, Ch- 91 : Lay Person

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee