Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/6086
DOI URL: http://dx.doi.org/10.21474/IJAR01/6086

RESEARCH ARTICLE

MANAGEMENT OF FINGERTIP INJURIES; VARIOUS SURGICAL PROCEDURES INVOLVED. A SINGLE CENTRE EXPERIENCE OF TWO YEARS.

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Manuscript Info

Manuscript History

Received: 17 October 2017
Final Accepted: 19 November 2017
Published: December 2017

Key words:-
Finger Tip Injuries, Flaps ,Surgical Procedures.

Abstract

Finger – tip injuries are one of the most common injuries faced in the Emergency department of any hospital. This article deals with the experience of our hospital, over a period of 2 Years – From September 2014 to September 2016 done as a prospective study. Ninety Patients that underwent some form of surgical Procedure were included and followed up over a period of six month. The analysis focused on factors such as mode of injury – viz. Domestic, Industrial, Road traffic accidents etc, Hand Dominance, Digit involved, Surface involved, Procedure employed, Time taken to return to work, functional outcome and aesthetics. Out of Ninety, Thirty eight patients could be followed up fully. Choice of surgical procedure was made based on the orientation and configuration of the wound. Most of the patients were right handed. Index finger was the commonest digit involved followed by middle, ring, little fingers and thumb. Return to work time was delayed in patients with heterodigital flaps. Most of the patients were satisfied with the aesthetic outcome.

Introduction:-

By definition fingertip is the region distal to the insertions of the flexor and extensor tendons at the base of the distal phalanx. It is very useful for fine proprioceptive touch and tactile sensations. It is the most frequently injured part of the hand. This ranks the third among reasons for the lost work days in the major countries around the world.

Treatment of these injuries focuses on maintenance of length of the digit, sensation, nail preservation, and cosmesis. Specific wound characteristics determine which method of treatment is optimal for a given patient, the ultimate aim being to provide the cover that is long lasting, sensate and with the right colour matching.

This study aimed at evaluating the different surgical techniques used for fingertip reconstruction and to evaluate the functional and aesthetic outcome of the same.

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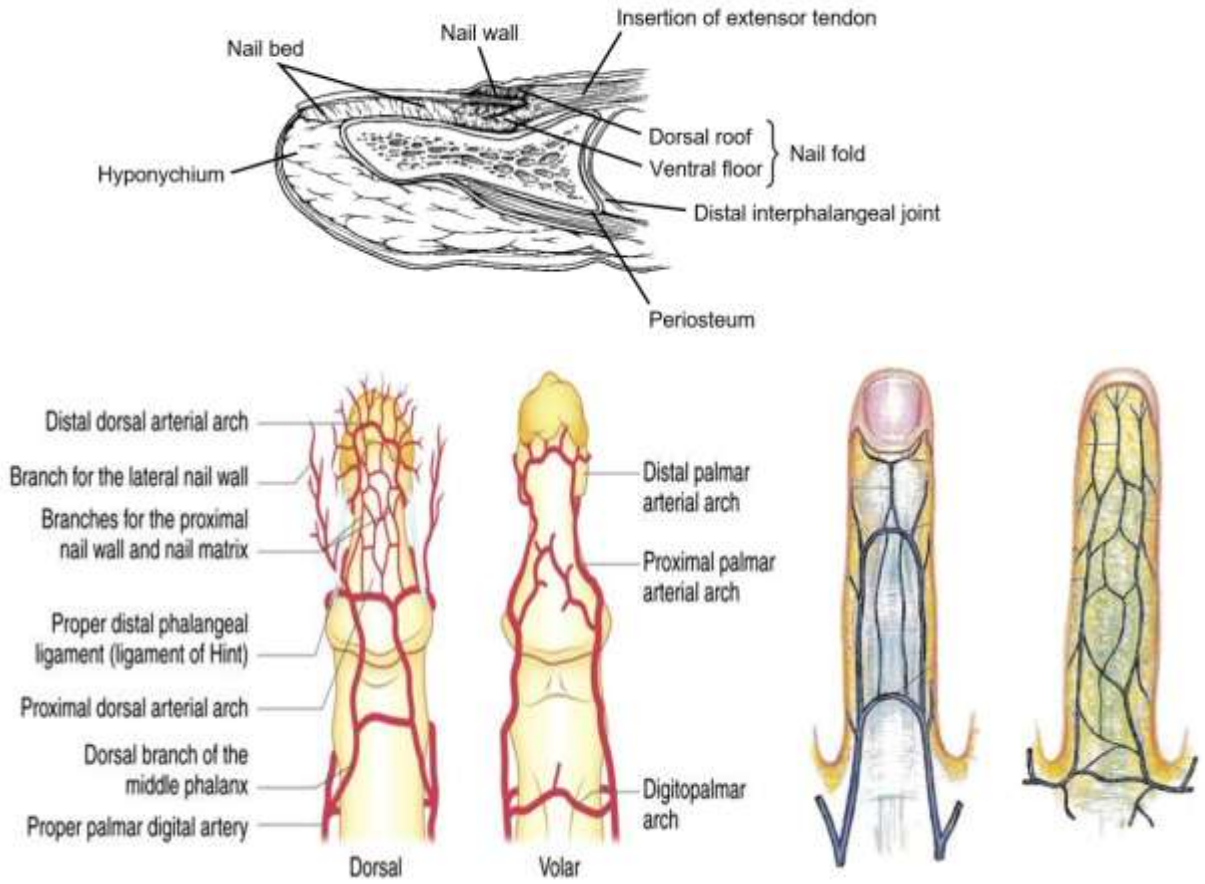
Anatomy:-



The two Palmar Digital arteries join in the midline at the level of Lunula to form the Pulp arcade which gives multiple branches adjacent to the periosteum.The central artery is usually the largest.

The superficial dorsal veins are the main channels for venous drainage from the finger tip.The venules commence at the sides of the nail and converge proximal to the nail bed,forming a central vein.the vein divides into two or three branches after passing 2-4 mm proximally.these branches converge again after passing over the distal interphalangeal joint.

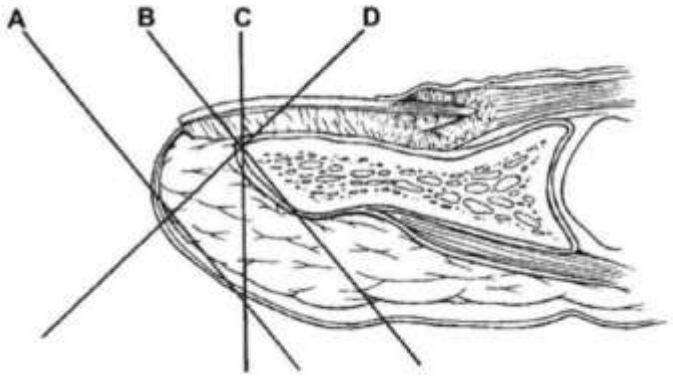
Classification of fingertip Injuries

A – Volar oblique , bone not exposed

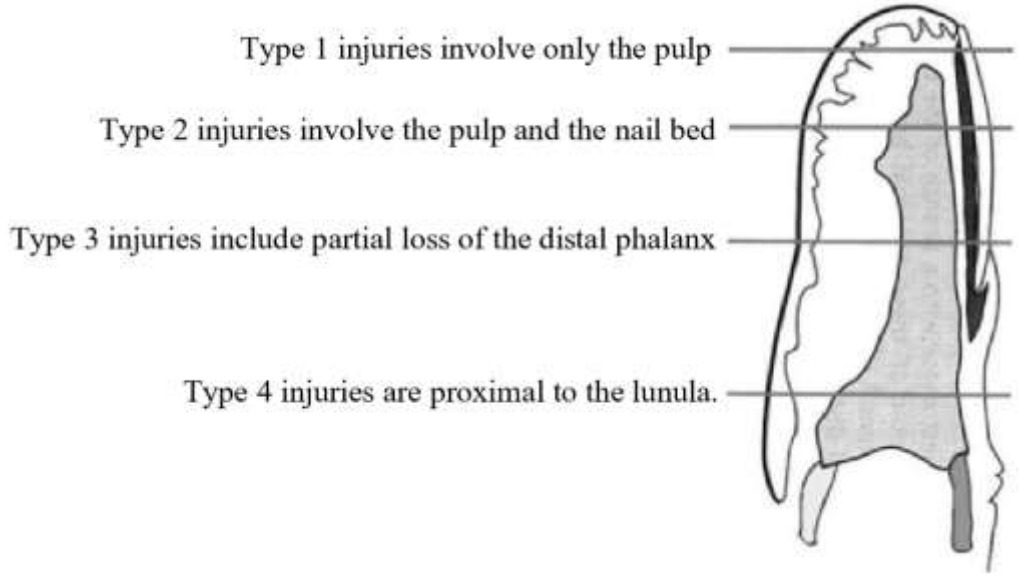
B – Volar oblique, bone exposed

C – Transeverse amputation

D – Dorsal oblique



Allens Classification



Some of the other classifications are by Sabapathy et al[1],Yamano[2],Ishikawa[3] et al .In 1997 Hirase[4]classified fingertip amputations based on the anastamotic level of digital artery. All these were made for treatment purpose especially to assess the feasibility for Replantation.

Decision Making:-

The ideal finger tip reconstruction should attempt to maintain length, preserve function and provide sensate soft tissue covering without pain during use. A shortened or stiff digit is usually disadvantageous both functionally and cosmetically[5]. With respect to appearance, loss of nail complex is of particular disadvantage, as is replacement of the digital skin by skin from elsewhere in the body which is different from colour, texture and thickness. For these reasons terminalisation is avoided and distal replantation, composite graft replacement and homodigital reconstruction are preferred whenever possible. Flap coverage of digital injury with exposed bone, tendon or joint is preferable as skin grafts applied to such defect are usually nondurable[6]. Flap coverage is also required for extensive bone exposure in order to maintain digital length. Superficial pulp wounds without exposed bone will heal by secondary intention or can be skin grafted[7,8,9,10]. Transverse amputations through the mid portion of the nail bed are best treated by primary closure or local advancement flap[11,12].

Immediate or early closure is of paramount importance for preservation of function and avoidance of complication.

The reason for various surgical techniques employed in the present study are outlined as follows.

Primary Closure:-
This option is employed if the location and amount of skin loss permits the placement of suture without excessive tension.

Skin grafting:-
Distal or volary directed tip amputation without exposed bone can be treated with skin graft. Paraesthesia, hypersensitivity, cold intolerance are reported but may be due to the injury rather than of the treatment. The ulnar side of hypothenar eminence provides a graft of excellent quality for the fingertip providing a glabrous skin.

Composite Grafting:-
Composite grafting is another method of management of fingertip injury. This technique is feasible only in children below six years of age and young adults with amputation distal to the lunula. A composite graft survives like a skin graft by plasma imbibition with later neovascularization and therefore must be immobilized as completely as possible. Successful composite tip replacement following amputation in larger adult digit is difficult to achieve. The success is more likely if the delay between amputation and replacement is short. Post operative cooling enhances the survival of composite graft[13].

Flap cover:
This becomes necessary when fingertip amputation is associated with exposed bone. They help in preserving the height / length which is of importance.

Homodigital Flaps:-
Homodigital flaps are flaps which are raised from the same digit as having the injury and are applied to the defect. These flaps have the advantages of simplicity, reliability and are relatively free of complications and provide satisfactory texture with an acceptable amount of time of absence from the work[14]. Also it does not involve any other digit with its concurrent complication (e.g. stiffness). The main advantage, however is it provides sensation with a similar cortical representation allowing early rehabilitation. They are quick to perform, they allow easy and independent mobilization of each digit and the use of local tissue respects the cosmetic principle of reconstruction of 'like with like'.

Some of the Homodigital flaps employed in the current series are depicted with representative pictures as follows

Atasoy flap

Kutlerflap

V-Y advancement flap

Oblique triangular flap

Heterodigital Flaps:-

Heterodigital flaps are raised from a digit other than the injured one. Their disadvantages being that they need immobilization resulting in stiffness of joints, require multiple stages of surgery, donor site needs to be skin grafted. These require two stage surgeries with consequent outcomes and donor site morbidity.

Cross Finger Flap:-

When there is a loss of greater that one third of the volar tissue of the fingertip especially with exposed flexor tendon, joint, or bone more tissue is required than with advancement-type flaps. The cross-finger flap is a popular option under these circumstances. This technique was first described by Cronin[15] in 1951 and is still widely used. Multiple fingertips can be covered simultaneously. Diseases that limit joint motion (such as arthritis and Dupuytren's disease) are contraindications. Patients with impaired digital circulation are also considered contraindications.

There are multiple donor choices for this flap. The middle finger can be used to cover the thumb, index, or ring fingers. The ring finger can be used to cover the long or small fingers. The flap is rectangular and is based on the midlateral line closest to the recipient digit. The plane of dissection is just dorsal to the paratenon. The donor site is covered with a full-thickness skin graft, and the flap is sutured to the recipient site. Division and inset of the flap is carried out in two to three weeks of time.

Thumb Tip Injury:-

Moberg volar advancement flap:-

Moberg's thumb advancement flap is used when there are amputations through the distal phalanx. The neurovascular bundles are identified and incisions are made on either side of the thumb, dorsal to the bundles. Dissection is carried down to the flexor sheath, and the flap is elevated off the flexor sheath. Usually the proximal metacarpal phalangeal crease of the thumb is the proximal margin of the dissection. The flap is then advanced to cover the defect.

NeuroVascular Island Flap:-

In the current series it was done on one patient who had a delayed presentation. The donor site is usually the ulnar aspect of the long or ring finger. It is essential to perform a digital Allen's test to the donor finger as well as to the adjacent finger before considering this flap. Attention is first turned to the recipient site. The scarred and sensitive area of the thumb tip is excised, and the defect is created and measured. The ulnar digital nerve is found and is prepared for anastomosis. The flap is then outlined on the donor digit and is incised, preserving the neurovascular bundle. The bundle is traced proximally as far as the superficial arch. As much perivascular fat as possible is kept with the bundle. The common digital vessel with the adjacent finger is divided, and the vessel is taken back to the superficial arch. A subcutaneous tunnel is created to the recipient site, and the island flap is passed into the recipient site. The flap should not be twisted or be tight in any way. A full-thickness graft is used to cover the donor site.

Results:-

Age wise distribution:

Age group	No.of patients	Percentage
Less Than 10	6	6.7%
11-20	15	16.7%
21-30	28	31.1%
31-40	23	25.6%
41-50	4	4.4%
51-60	8	8.9%
61-70	6	6.7%
Total	**90**	**100.0%**

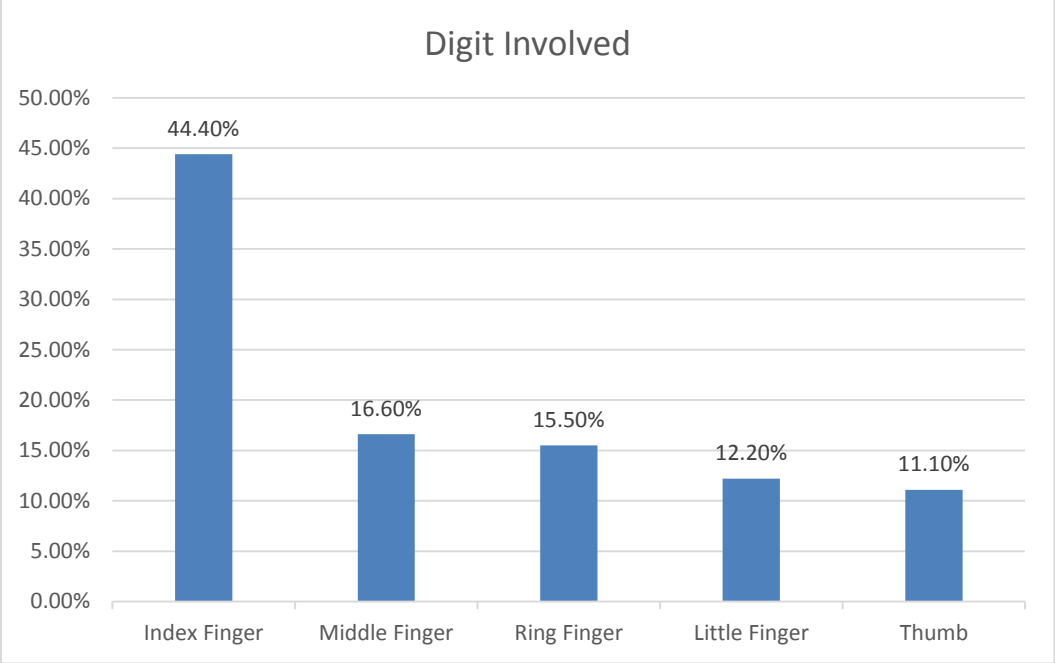
Gender wise distribution:

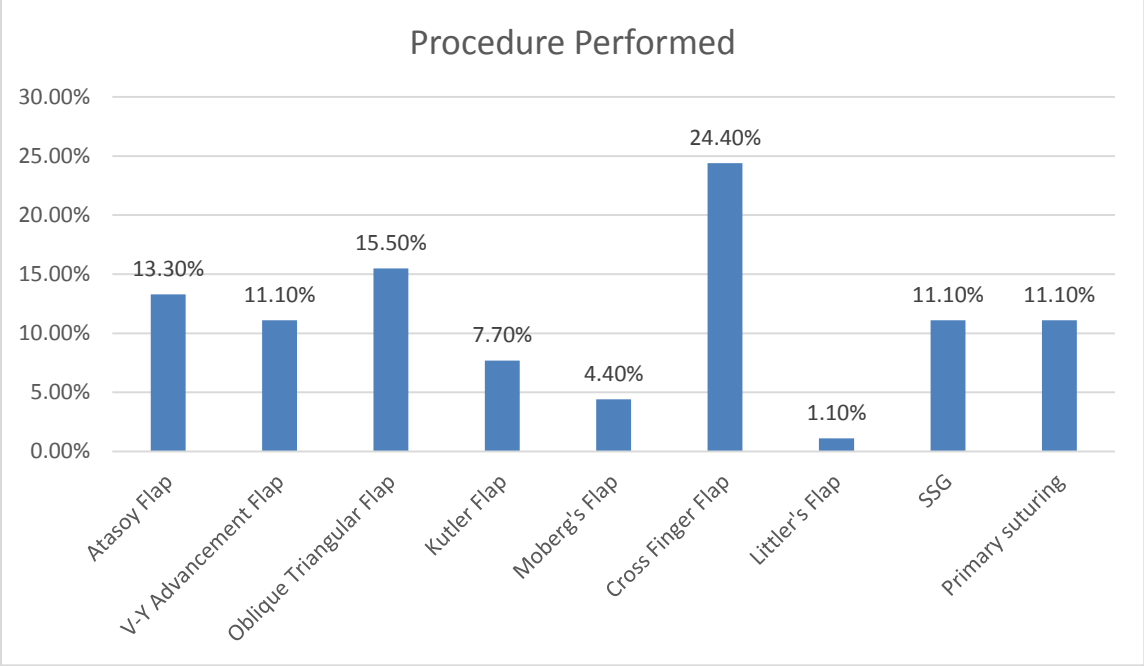
Sex	No.of patients	Percentage
Male	63	70%
Female	27	30%
Total	**90**	**100.0%**

Mode of Injury:

Mechanism of injury	No.of patients	Percentage
Door Trap	4	4.4%
Fall of Heavy Object	10	11.1%
Glass cut	10	11.1%
Juicer Injury/household	23	25.6%

Machinery Injury	33	36.7%
Road Traffic Accident	10	11.1%
Total	**90**	**100.0%**





Discussion:-

Fingertip injuries are extremely common and comprise the most common hand injuries. They are often viewed as a relatively minor injury but their improper management can lead to considerable loss of skilled hand function. Fingertip injuries lead to significant morbidity affecting the occupational as well social activities. They account for approximately 10% of all accidents reported in the casualty and two – thirds of hand injuries in children. Goals of

treatment in fingertip injuries include preservation of useful sensation, maximizing functional length, preventing joint contractures, providing satisfactory appearance and avoiding donor disfigurement and functional loss.

In our study Machinery injury was the leading cause. Right hand dominance was observed in all patients. Index finger was the commonest digit involved. The choice of management depended on orientation and configuration of the wound, injured digit, the surface involved on the lines discussed in 'Decision Making'. Cross finger flap was the maximum performed flap because most of the injuries were of volar-oblique type. The duration of return to work was delayed in patients who underwent two staged procedures.

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