

ORIGINAL ARTICLE

Salvaging The Thumb : Manipal Hospital Experience

S T Digvijay¹, P C Majhi², S N Bawa³**Abstract**

From the period of 2002-01-01 to 2003-11-30 all the thumb salvage procedures at Manipal Teaching Hospital were included. There were a total number of 15 cases. The mean age was 35.06 years and 2/15 (13.33%) were females and 13/15 (86.67%) were males. The mean number of procedures done to achieve patient satisfaction was 1.8 with a minimum of 1 and maximum of 3. The average time period for the final satisfactory appearance and function was 20 days. The first procedure attempted was hipedicled flap (6), groin flap (5), replantation (2), radial forearm flap (1) and osteoplastic reconstruction (1). We did not have any digit loss after decision to salvage was taken.

Key words: Thumb, reconstruction, replantation, microsurgery.

Introduction

The profound disability resulting from the loss of a thumb obliges a surgeon to reimplant an amputated thumb to restore the hand function. Not all attempts will result in survival of the amputated portion. Unreconstructable damage precludes replantation. Alternative available methods must be resorted to deal with the sequel of thumb loss. Phalangization of the thumb metacarpal described by Huguier¹ in 1874 is one of the first reported procedures to deal with the loss of the thumb. Nicolandi² in Vienna reported the first toe-to-thumb transfer in 1897. It was a staged procedure needing the hand to be attached to the foot for 3 weeks. Gosset³ in 1949 described pollicization of the index finger. Microsurgical advances finally made this

surgery predictable and accepted. In 1966 Buncke⁴ et al reported the first successful great toe to thumb transfer in rhesus monkeys. Cobbet⁵ followed it in 1969 in human. Surgeon and patient must have realistic expectation as regards the outcome of replantation. Survival rates are highest in laceration injuries and lowest in avulsion injuries and range from 46% to 91%^{6,7}. Usually patients will report satisfaction with results of successful replantation⁸. Quite functional results are quite attainable with various reconstructive procedures in the event of replantation failure or unsalvageable digit.^{9,10}

Materials And Methods

The vascular surgery division of Department of general surgery of Manipal Teaching Hospital keeps a prospective computerized database of all the microsurgery that has been done. Injuries to the thumb were included with the following criteria:

- 1 Assoc. Prof. Dept. of Surgery, Manipal Teaching Hospital, Pokhara, Nepal
- 2 Assoc. Prof. Dept. of Anesthesiology, Manipal Teaching Hospital, Pokhara, Nepal.
- 3 Professor & Head, Dept. of Anesthesiology, Manipal Teaching Hospital, Pokhara, Nepal

1. Cases from 2002-01-01 to 2002-11-30.
2. Skin loss to the thumb not amenable for skin grafting (whether full or partial thickness).

3. Amputated digit for which revascularization/replantation was the first procedure.
4. Compound fractures involving bone, tendon and neurovascular bundle.
5. Previously amputated thumbs referred for reconstructive procedures.

Single nerve and vessel injuries were excluded. The end point was up to the satisfaction of the patient. This was defined as 'the point from which the patient did not get operated for further reconstructive procedure.'

Results

There were a total number of 15 cases. Middle aged adults comprised the most cases; mean age was 35.06 years. Most were males 86.67% (13/15). Most common etiology was laceration 33% (5/15) {see Table: II}.

Case	Age	Sex	Mode	First procedure	Procedures (Total)	Morbidity (Days)
1	50	F	Avulsion.	Bipedicled flap.	3	35
2	45	M	Burn.	Bipedicled flap.	2	21
3	23	M	Avulsion.	Groin flap.	2	21
4	25	F	Burn.	Bipedicled flap.	2	21
5	26	M	Amputation.	Replantation.	1	21
6	35	M	Avulsion.	Bipedicled flap.	3	21
7	40	M	Avulsion.	Bipedicled flap.	2	21
8	41	M	Laceration.	Groin flap.	2	21
9	42	M	Near amputation	Groin flap.	2	25
10	55	M	Laceration.	Groin flap.	2	24
11	12	M	Amputation.	Replantation.	1	21
12	15	M	Laceration.	Groin flap.	2	21
13	60	M	Laceration.	Radial forearm flap.	1	5
14	35	M	Amputation.	Osteoplastic reconstruction.	1	15
15	22	M	Laceration.	Bipedicled flap.	2	21

Table: I Details of the present series of thumb salvage in the said period.

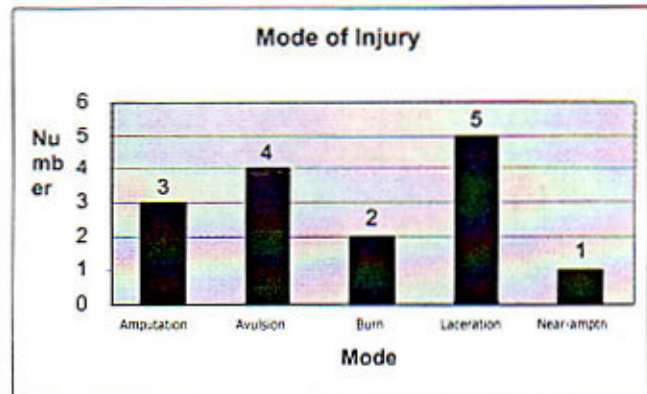


Table I: Mode of injury in this series

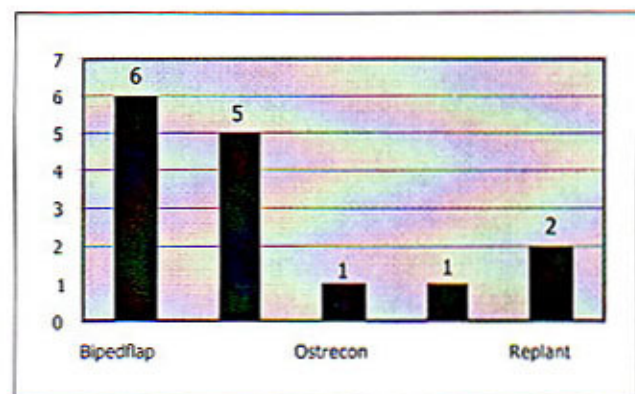


Table II: First procedure done.

The most common first procedure attempted was the bipedicled flap (n=6) followed by groin flap (n=5)[See plate 1.1/1.2/1.3]. Rest were replantation (n=2) [See plate 2.1/2.2], osteoplastic reconstruction [See plate 3.1/3.2/3.3/3.4] and radial forearm flap, (see Table, 3.). The mean time from first hospital visit to satisfactory outcome for the patient was 20 days with range from 5 to 35 days. The average cost incurred for the patients could not be calculated. We did not loose any digit of the patient after salvage attempt. Both the replantation were done within 12 hours of the thumb amputation.

Discussion

Thumb amputation is a generally accepted criterion for attempted replantation¹¹. Alternatives to thumb amputation will have to be considered for patients not candidates for replantation. The goals in thumb reconstruction will be sensate and non-tender thumb tip with intact semibility, stability at interphalangeal and metacarpophalangeal joint and if possible mobility at the joints. Distal amputations will usually require surfacing with sensate flaps. Intermediate length amputations will need phalangization (deepening of web space) with sometimes distraction lengthening. Amputation close to MCPJ is considered a perfect case for toe-to-thumb transfer. Absence of metacarpal base will mandate pollicization of other digit. Age, general health, occupation and demands of the patient are the factors that must be given adequate weight in decision-making process¹². Young model women will be unsatisfied with osteoplastic thumb reconstruction naturally and so will an athlete resist surrendering his great toe. Though multiple digit amputation will be a relative contradiction to pollicization, a damaged digit could easily be pollicized with good results¹³. Toe-to-thumb transfer will be best suited for proximal amputation patients with high functional demands¹⁴⁻¹⁸. Revision of amputation will be considered in those patients to whom the amputated part is unsalvageable. Distal amputations with minimal bone loss will be treated with soft tissue covering with intact sense like palmar advancement flap, neurovascular island flap from the ring finger or first dorsal metacarpal artery flap¹⁹⁻²¹. Palmar advancement flap will generally not be considered if defect is more than 2 cm²⁰. Defects of the entire palmar surface of the thumb can be resurfaced with

conventional cross finger to thumb flap (random pattern flap and staged procedure) or the first dorsal metacarpal artery flap (axial flap with same skin as cross finger flap)²²⁻²⁴. The neurovascular island flap from the ring finger is rarely used nowadays because of very tedious dissection. Phalangization deepens the web space and is suitable for intermediate level amputations. Simple Z plasty can substantially enhance grasping ability²⁵. Double opposing Z plasties, release of part of the first interosseous muscle and proximal transfer of the adductor pollicis all can be used to gain additional length^{9,15,26}. Phalangization alone is a rare treatment option and is usually added on with distraction lengthening of the thumb metacarpal as described by Matey²⁷. The distraction apparatus has to be applied with the proximal and distal fragments in contact, usually several days after the osteotomy. 1mm/day lengthening is possible. Once adequate length is achieved to promote healing bone grafting and internal fixation may be needed¹⁵⁻¹⁹. Lengthening of up to 4 cm has been achieved²⁷. After completion of distraction Z plasty of first web space is needed²⁸. Before microsurgery became popular osteoplastic reconstruction was the preferred mode of management. This involves corticocancellous bone graft and tube pedicled flaps, and is used for very proximal amputations¹². The length required is equal to the interphalangeal joint of the normal thumb¹⁵. Tube pedicled flaps could be groin (most common) but needs 4 weeks of maturation time and immobilization, or radial forearm flap a single stage procedure, which sacrifices a major artery to the hand. Both will usually need neurovascular island flap for sensation later^{21,29-31}. Pollicization is a one stage procedure which restore length, provides

motion, and results in a near normal sensation with very acceptable deficits in appearance and function of the remainder of the hand^{15,32,33}. Toe-to-thumb transfer is the method of choice among the composite tissue transfer techniques³⁴⁻³⁷. Others are first dorsal metacarpal artery flap and radial forearm osseocutaneous flap. The patient should realize that the failure rate of toe-to-thumb transfer is quoted at 10%^{35,39,40}. This can affect gait but the problem is acceptable^{39,41-43}.

Conclusion

The patient need rather than your ability to perform a procedure should direct decision-making process. All options must be considered. Patient and surgeon should be in harmony regarding each step of this multiple stage procedure. Counselling, team approach, physiotherapy and honest appraisal of the result will usually mean satisfied patients and surgeons. Any surgeon, well exposed to reconstructive surgery techniques would be capable of undertaking this challenge if he is adequately interested in the surgery.

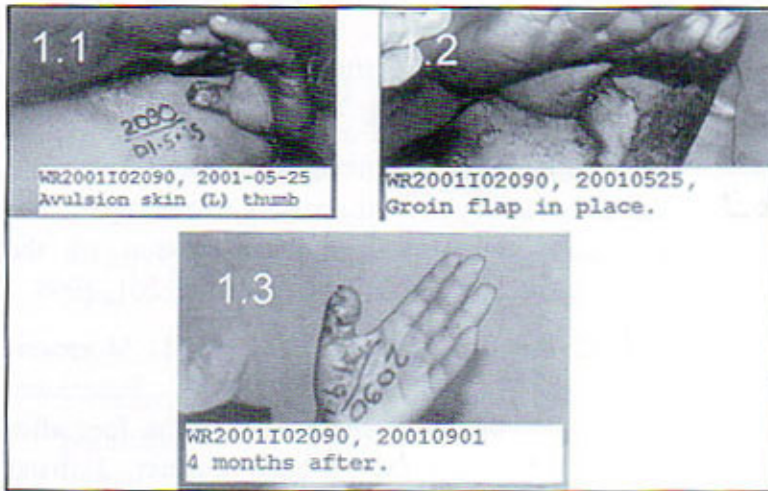
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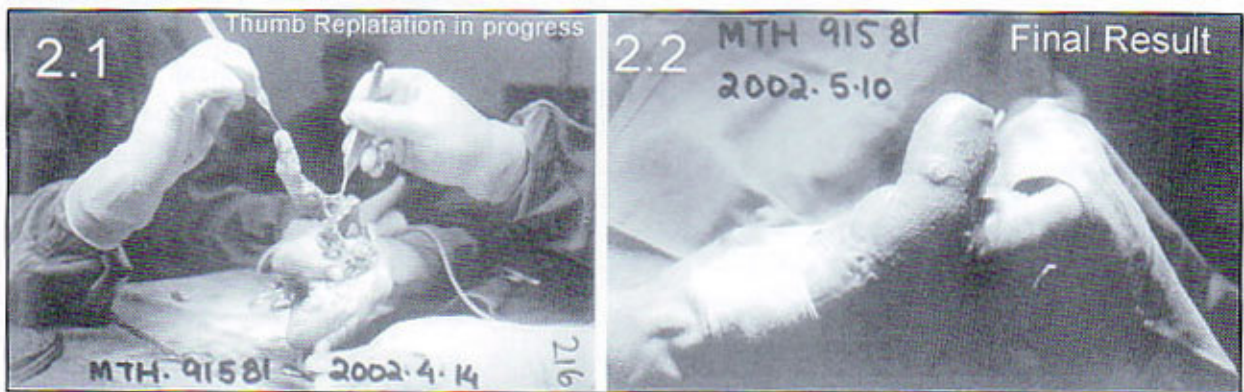
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Plate Description



- 1.1 Major skin loss of (L) thumb for flap cover.
- 1.2 Groin flap in place.
- 1.3 4 months post op.



2.1 Thumb replantation in progress

2.2 Final post operative result

- 3.1 Amputated thumb and little finger (L) hand.
- 3.2 Base of V metacarpal harvested for bony framework.
- 3.3 Radial forearm flap demarcated for soft tissue replacement.
- 3.4 1 month postoperative view.

