

## Case Report

# Osteoplastic thumb reconstruction in a case of neglected hand burn

RAHMAN H<sup>1</sup>, AZAD AKM<sup>2</sup>, HASSAN S<sup>3</sup>, KHAN MAH<sup>4</sup>, ROUF RS<sup>5</sup>

### Abstract

*In this article we report a case of neglected hand burn with total loss of thumb with additional first web space and wrist contracture of the nondominant hand of a young female. Osteoplastic technique was applied for thumb reconstruction with additional fillet flap and posterior interosseous flap for first web space and thenar area. In this era of microsurgical reconstruction this simple and basic technique can still be useful in selected cases.*

### Introduction

Function of the hand is significantly impaired by loss of thumb. Human thumb is uniquely endowed with the anatomic characteristics which allow circumduction and opposition. All basic functions of the hand (pinch, grasp and hold) as well as fine manipulations require thumb<sup>1</sup>. So loss of thumb secondary to trauma results in significant loss of function than loss of any other digit. For that every effort should be given to reconstruct an opposing thumb. Numerous techniques have been developed for total thumb reconstruction ranging from distraction osteogenesis to complex microsurgical reconstruction<sup>2</sup>. The goals of total thumb replacement are to achieve length, stability, mobility, sensation and pain free movement. However, treatment plan should be individualized based on occupation, hand dominance, subjective need, intelligence and motivation of the patient. While planning treatment goal surgeon should consider these factors because if the patient is a skilled worker he needs sensibility and mobility while a manual laborer may sacrifice mobility for stability and power. Whatever surgical method is applied, it is a challenging but rewarding surgical endeavor.

### Case report

A twenty one year old female patient came to Burn and Plastic Surgery OPD, Sylhet Osmani Medical College with history

1. Dr. Hasib Rahman, Assistant Professor, Plastic Surgery, Sylhet MAG Osmani Medical College and Hospital.
2. Dr. Md. Abul Kalam Azad, Assistant Professor, Surgery, Sylhet MAG Osmani Medical College and Hospital.
3. Dr. Shamim Hassan, Consultant Plastic Surgeon
4. Md. Hedayet Ali Khan, Registrar, Burn Unit, DMCH
5. Dr. Rushda Sarmin Binte Rouf, Medical Officer, BIRDEM.

**Correspondence:** Dr. Hasib Rahman, Assistant Professor, Plastic Surgery, Sylhet MAG Osmani Medical College and Hospital. Email: dr.hasibrahman@gmail.com; cell phone:01711-016996.

of flame burn of her non dominant hand four months back. She was inadequately treated in local health center and on presentation there was no soft tissue coverage on her flexor surface of the left thumb, proximal and distal phalanges were exposed and not viable. There was first web space contracture, flexion contracture of left wrist and unstable scar over thenar area, flexor surface of the wrist and distal forearm. There was no opposition or circumduction of thumb. Wrist extension was restricted so that gripping was also weak for other fingers. She is a right hand dominant person and works as a cleaner.



**Fig.-1:** Four month old flame burn of left hand, showing loss of soft tissue and exposed dead phalanges

### Treatment

Considering her social status, occupation, intelligence and hand dominance a staged osteoplastic thumb reconstruction was planned. However, patient had other problems needing attention such as first web space contracture and flexion contracture of wrist and loss of soft pliable tissue for thenar

area. Dorsal skin of the thumb was healthy and was planned to use as fillet flap for first web space. But first of all, patient needed debridement of all dead bones.

Step 1: debridement of all dead bones (proximal and distal phalanges with head of first metacarpal)



**Fig.-2:** all dead bones removed including both phalanges and head of first metacarpal. Note that dorsal skin was preserved for use as a fillet flap for first web space.

Step 2: Release of first web space and reconstruct it with fillet flap.

Step 3: Release of wrist contracture and excision of all scar over thenar area.

Step 4: Posterior inter-osseous flap was raised to cover thenar area and raw area resulted from release of wrist contracture.



**Fig.-3:** PIA flap raised



**Fig.-4:** PIA flap inset over thenar area

Step 5: Harvesting cortico-cancellous iliac crest bone graft. Harvested bone graft was 7X1.5X1.5cm. Bone graft was fixed with 1<sup>st</sup> metacarpal with K-wires.



**Fig.-5:** Harvesting iliac crest bone graft



**Fig.-6:** bone graft fixed with K wire

Step 6: Groin flap to cover corticocancellous bone graft.



**Fig.-7:** Groin flap cover of bone graft

Step 7: Groin flap divided at 3<sup>rd</sup> week. K-wires removed at 8 weeks.

**Follow-up:** Patient was reviewed after six months and found to have good holding, moderate opposition and pinching movement.



**Fig. 8 (a)**



**Fig. 8 (b)**

**Fig 8(a) (b):** showing holding a glass and a cell phone



**Fig 9:** satisfactory pinching and opposition

**Discussion**

Osteoplastic techniques are based on combining a nonvascularized bone graft with a tube pedicle flap for adding length to the thumb. However these reconstructions exhibit poor sensations and significant bone resorption over time<sup>3,4</sup>. Nevertheless osteoplastic reconstruction is useful when amputation is at the distal metacarpal level and when a functional carpometacarpal joint and intrinsic muscle cone is present. In addition this method may be the best option if the other fingers are normal or too badly damaged for transfer or when microsurgical reconstruction is not possible<sup>5</sup>. In general terms it is well established that microsurgical reconstruction with toe transfer and its modifications are the best option for total thumb reconstruction<sup>6</sup>. But the need to individualize the treatment based on her/his occupation, hand dominance and functional requirement cannot be over emphasized. In this case, presence of necrotic bone, unstable scars and contracture made the surgical planning difficult. Considering her occupation, intelligence and hand dominance microsurgical options were not considered. At the same time condition of the other fingers as well as her soft tissue loss and contracture made her a poor choice for pollicization. Another interesting fact in this case is that contracture release and soft tissue cover of the wrist and thenar area with posterior interosseous flap was done in the same sitting. Classic osteoplastic reconstruction described by Nicoladini required multiple stages starting with tubed pedicle flap, its division and finally fixation of bone graft<sup>5</sup>. In this case we put the bone graft in the same sitting within tube pedicle (Groin) flap with additional fillet flap for first web space and posterior interosseous flap for wrist and thenar area. Although it required additional operating time, in the long run treatment cost and total period of treatment was reduced. Functional review after six months showed the patient having satisfactory basic functions of hand. Reconstructed thumb was a bit bulky with poor aesthetic appearance. Sensation could be improved with a

neurovascular island flap from ring finger but previous burn may preclude harvesting an island flap of adequate size. Although this case was challenging, results were rewarding with a very basic and simple technique of osteoplastic thumb reconstruction.

### References

1. Emerson ET, Krizek TJ, Greenwald DP. Anatomy, physiology, and functional restoration of the thumb. *Ann. Plast. Surg.* 1996; 36: 180.
2. Imeda T, Cooney, WP. Functional anatomy and biomechanics of the thumb. *Hand Clin.* 1992; 8: 9.
3. Strickland JW, Kleinman WB. Thumb reconstruction. In D. P. Green (Ed.), *Operative Hand Surgery* 3rd Ed. New York: Churchill Livingstone; 1993.
4. Chung KC, Wei, FC. An outcome study of thumb reconstruction using microvascular toe transfer. *J. Hand Surg. (Am.)*. 2000; 25: 651.
5. Buncke HJ, Buncke CM, Schulz WP. Immediate Nicoladoni procedure in the rhesus monkey, or hallux-to-hand transplantation, utilizing microminiature vascular anastomoses. *Br. J. Plast. Surg.* 1986;19: 332.
6. Wei FC, Jain V, Chen SH . Toe-to-hand transplantation. *Hand Clin.* 2003;19: 165.