Osteoplastic Reconstruction of the Thumb: Technique and Outcomes After More Than 6 Years of Follow-Up

Nadia Gabotto Loredo, Gonzalo M. Viollaz, Diego J. Gómez, Gustavo J. Teruya, Álvaro J. Muratore, Alejandro Tedeschi, Rafael Durán

Upper Limb Team, Hospital Británico de Buenos Aires, Autonomous City of Buenos Aires, Argentina

ABSTRACT

The thumb accounts for 40% of hand function, and its loss requires reimplantation or reconstruction. Although reimplantation is the ideal treatment, alternative options are necessary when it fails. Osteoplastic reconstruction constitutes a less complex and less invasive option. We present the case of a 58-year-old man who underwent osteoplastic thumb reconstruction following a failed reimplantation after a metacarpophalangeal (MCP) amputation. The surgical technique, clinical outcomes, and radiological findings after more than 6 years of follow-up are described. **Conclusions:** Osteoplastic reconstruction using an iliac crest graft and an inguinoabdominal flap is a safe and effective option for thumb reconstruction after failed MCP-level amputations. It provides good functional outcomes and is reproducible in settings without access to more complex reconstructive techniques.

Keywords: Thumb reconstruction; traumatic amputation; inguinoabdominal flap; iliac crest graft.

Level of Evidence: IV

Reconstrucción osteoplástica del pulgar. Técnica y resultado luego de más de 6 años de seguimiento

RESUMEN

El pulgar representa el 40% de la función de la mano, y su pérdida requiere un reimplante o reconstrucción. Aunque el reimplante es el tratamiento ideal, existen alternativas ante el fracaso. La reconstrucción osteoplástica es una opción menos invasiva. Se presenta un caso de reconstrucción osteoplástica del pulgar tras un reimplante fallido en un hombre de 58 años con amputación metacarpofalángica. Se detallan la técnica quirúrgica, los resultados clínicos y radiológicos tras 6 años de seguimiento. **Conclusiones:** La reconstrucción osteoplástica con injerto de cresta ilíaca y colgajo inguinoabdominal es una opción segura y eficaz para la reconstrucción del pulgar tras amputaciones metacarpofalángicas fallidas, ofrece buenos resultados funcionales y es replicable en entornos sin acceso a tratamientos más complejos.

Palabras clave: Reconstrucción de pulgar; amputación traumática; colgajo inguinoabdominal; injerto de cresta ilíaca.

Nivel de Evidencia: IV

INTRODUCTION

The thumb contributes approximately 40% of hand function; therefore, its complete loss at the metacarpophalangeal level, or Lister's group 4,[1] requires restoration or reconstruction.

The requirements for a functional thumb are stability, adequate length, mobility, sensibility, and absence of pain.[1-3]

Although replantation is the best option, when it is not possible or when it fails, several reconstructive alternatives exist. The current gold standard is free vascularized toe-to-hand transfer. However, this is a technically demanding procedure and requires amputating part or all of a healthy toe, which may be unacceptable to some patients.[2-4]

Other reconstructive options include deepening of the first web space (phalangization), transposition (pollicization) of another finger, and osteoplastic reconstruction.[1,2]

Received on September 15th, 2024. Accepted after evaluation on May 17th, 2025 • Dr. NADIA GABOTTO LOREDO • gabottonadia@gmail.com https://orcid.org/0009-0001-8122-0237

How to cite this article: Gabotto Loredo N, Viollaz G, Gómez D, Teruya G, Muratore Á, Tedeschi A, Durán R. Osteoplastic Reconstruction of the Thumb: Technique and Outcomes After More Than 6 Years of Follow-Up. *Rev Asoc Argent Ortop Traumatol* 2025;90(6):570-577. https://doi.org/10.15417/issn.1852-7434.2025.90.6.2030

The aim of this article is to report our experience with osteoplastic reconstruction as an alternative for thumb loss at the metacarpophalangeal level (group 4) in patients who declined toe-to-hand transfer. The technique used, as well as the clinical and functional outcomes after more than 6 years of follow-up, are described.

CLINICAL CASE

A 58-year-old male pharmacist presented with a traumatic amputation of the thumb at the metacarpophalangeal level, with a failed replantation attempt, in his dominant hand. Because he declined reconstruction using a toe-to-hand transfer, osteoplastic reconstruction was proposed (Figure 1).

Figure 1. AP (**A**) and oblique (**B**) radiographs of the affected hand in the emergency setting (thumb amputation).

Technical Details

First Stage

1) Marking of the donor area for the inguinoabdominal flap: the vascular pedicle was identified, and the flap was planned according to the surface area required to cover the neothumb.

2) Harvesting of the iliac crest flap: a structural iliac crest graft was obtained and shaped to match the dimensions of the contralateral thumb.

3) Fixation of the iliac crest graft: the graft was stabilized to the remaining base of the proximal phalanx using wire cerclage in the coronal and sagittal planes of the metacarpophalangeal joint, supplemented with temporary Kirschner wires. If tendon remnants are present, a tenoplasty may be performed; this was not required in our patient (Figure 2).

Figure 2. AP (**A**) and oblique (**B**) follow-up radiographs of the affected hand. Iliac crest graft plus wire cerclage.

4) Coverage of the graft with the tubulized flap: the bony graft of the neothumb was covered with the tubulized inguinal flap, with maximal thinning of the adipose layer.

Second Stage

1) Flap division: three weeks after the first stage, the inguinal flap was divided, yielding a reconstructed neothumb.

Reoperations: Debulking procedures are required to reduce flap volume when excess abdominal fat is present. In this case, two subsequent reoperations were performed.

After 6 years of clinical and radiological follow-up, the patient reports no pain or subjective limitations for work or sports activities (DASH [*Disabilities of the Arm, Shoulder and Hand*] score 19/100; PRWE [*Patient-Rated Wrist Evaluation*] score 43/100). He uses a strong modified tip-to-tip pinch, with full closure of the remaining four fingers. Grip strength is 75% compared with the contralateral hand, measured with a Jamar dynamometer. He has anesthesia over the flap area, without contact-related injuries (Figure 3).

Figure 3. Clinical follow-up 6 years after surgery.

Radiographs show partial bone remodeling due to resorption, with a 10% loss of graft length, without clinical implications or fragility-related findings (Figure 4).

It is worth noting that the modified pinch is functional with all fingers, allowing adequate opposition and stability of the neothumb during precision tasks. This grasping ability is demonstrated in Figure 5, which shows correct functional integration of the reconstructed thumb in both fine pinch and power maneuvers.

Figure 4. Radiographic follow-up 6 years after surgery.

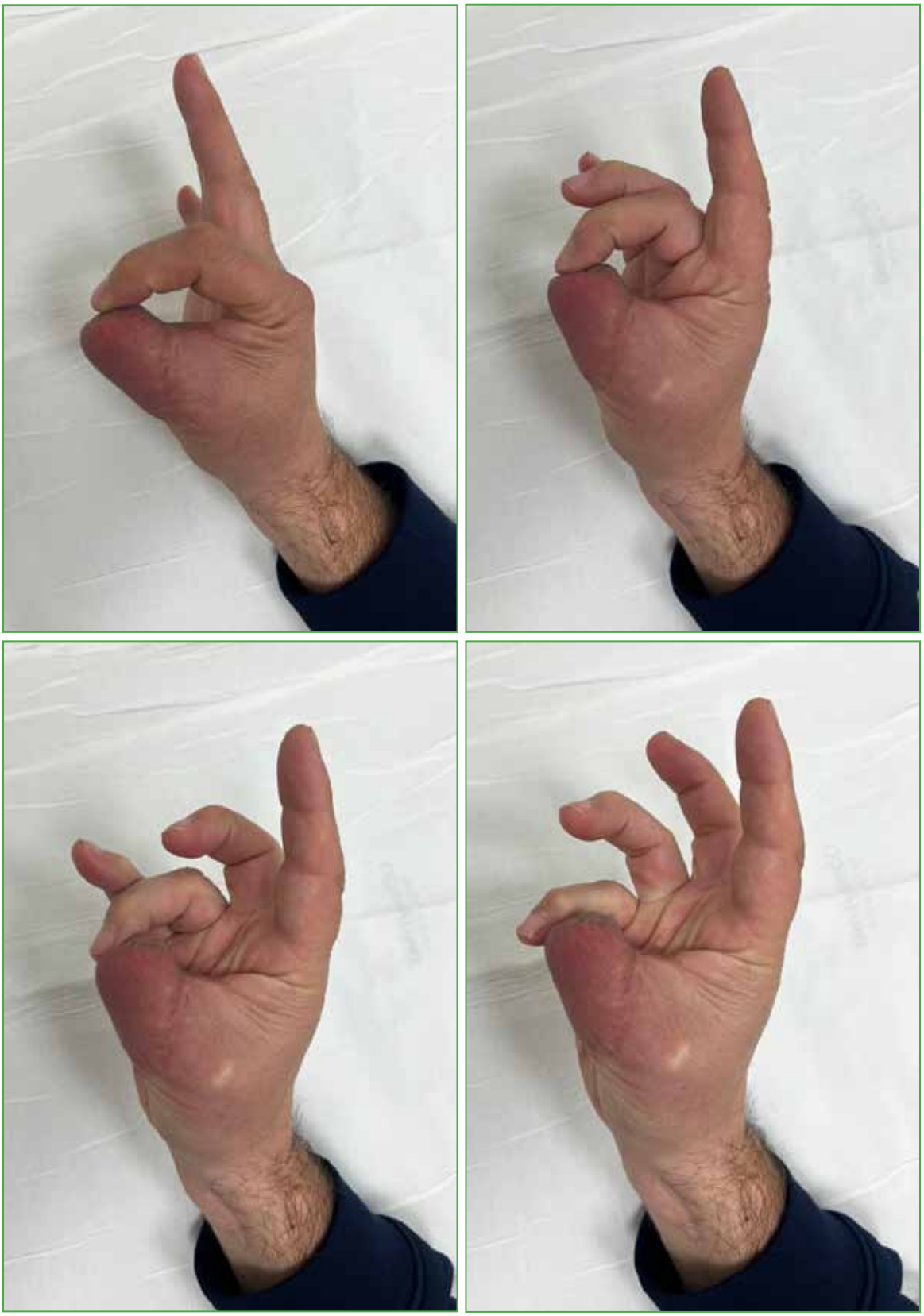

Figure 5. Clinical follow-up 6 years after surgery. Functional modified tip-to-tip pinch.

DISCUSSION

Reconstruction of the thumb after traumatic amputation at the metacarpophalangeal joint is essential due to the crucial function this digit provides. The case presented required a critical decision regarding the most appropriate reconstructive technique. Although free vascularized transfer of a toe to the hand is considered the gold standard procedure for thumb reconstruction, the patient declined this option, mainly due to concerns about sacrificing a healthy toe. This led to choosing osteoplastic reconstruction as an alternative.

Osteoplastic reconstruction, as described in our patient, is documented as a viable technique and one that is less demanding than toe-to-hand transfer. Graham et al. emphasize that osteoplastic reconstruction remains a preferred option in settings where resources are limited or when patients wish to avoid more invasive microsurgical procedures.[1,2] In this case, the decision to select this technique was consistent with these indications, as it provides a functional solution without the need to sacrifice a toe.

In the 6-year long-term follow-up, the results are favorable: the patient maintains significant functionality, is pain-free, and exhibits good adaptation to work and sports activities. These findings are consistent with published reports indicating that although osteoplastic reconstruction may result in partial loss of graft length due to bone remodeling, this generally does not compromise long-term function.[4] In our case, the 10% loss of graft length had no significant clinical repercussions, reaffirming the robustness of this technique in providing long-term stability and functionality.

The literature also mentions possible complications, such as venous congestion, delayed wound healing, and bone resorption, that may affect outcomes. However, no major complications occurred in this case, suggesting that meticulous surgical planning and appropriate patient selection are key factors for success.

Anesthesia in the flap area and the need for subsequent debulking procedures to reduce flap volume were appropriately managed, in line with previously reported challenges regarding excess tissue in inguinoabdominal flap reconstructions.[4]

Regarding functional outcomes, the patient achieved 75% of grip strength compared with the contralateral hand and used a modified tip-to-tip pinch. These results are comparable to those reported in other osteoplastic reconstruction studies. The DASH (19/100) and PRWE (43/100) scores reflect moderate impairment in daily activities but with significant functional adaptation, similar to that described in other published case series.[4]

CONCLUSIONS

Osteoplastic reconstruction using an iliac crest graft and an inguinoabdominal flap represents a safe and effective option for thumb reconstruction following failed metacarpophalangeal amputations. The technique provides functional clinical results ranging from good to excellent and can be replicated in settings lacking the capacity to perform more complex microsurgical procedures.

Conflicts of interest: The authors declare no conflicts of interest.

G. Viollaz ORCID ID: https://orcid.org/0000-0002-4573-883X
D. Gómez ORCID ID: https://orcid.org/0000-0003-0258-6802
G. Teruya ORCID ID: https://orcid.org/0000-0001-7342-1859
Á. Muratore ORCID ID: https://orcid.org/0000-0001-7540-7137
A. Tedeschi ORCID ID: https://orcid.org/0000-0001-5704-3122
R. Durán ORCID ID: https://orcid.org/0000-0002-8789-3221

REFERENCES

1. Graham D, Bhardwaj P, Sabapathy SR. Secondary thumb reconstruction in a mutilated hand. *Hand Clin* 2016;32(4):533-47. https://doi.org/10.1016/j.hcl.2016.07.005
2. Salah MM, Khalid KN. Thumb reconstruction by grafting skeletonized amputated phalanges and soft tissue cover – A new technique: A case series. *Cases J* 2008;1(1):22. https://doi.org/10.1186/1757-1626-1-22
3. Moazin OM, Bhat TA, Suraya F, Alelyani RH, Assad M, Alazzmi HA, et al. Spiral wrap-around technique in the reverse radial artery fasciocutaneous forearm flap for thumb reconstruction: A report of an innovative technique. *Cureus* 2023;15(12):e50999. https://doi.org/10.7759/cureus.50999
4. Cheema TA, Miller S. One-stage osteoplastic reconstruction of the thumb. *Tech Hand Up Extrem Surg* 2009;13(3):130-3. https://doi.org/10.1097/BTH.0b013e3181a819ed