

AUTOLOGOUS FASCIA LATA GRAFTING WITH SCALP FLAP COVERAGE: A  
NOVEL STRATEGY FOR COMPLEX DURAL DEFECTS

H. Lahmidi\*, A. Meftah, A. Fikry, M. Habla, A. El Youssefi, S. Karti, S. Sabur, A. EL Harti and M. Diouri

Plastic and Reconstructive Surgery Department, National Burn Center, CHU Ibn Rochd, Morocco.



\*Corresponding Author: Dr. H. Lahmidi

Plastic and Reconstructive Surgery Department, National Burn Center, CHU Ibn Rochd, Morocco.

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## ABSTRACT

**Introduction:** Restoration of dural integrity after surgical resection is crucial to prevent cerebrospinal fluid (CSF) leakage and infectious complications. Autologous grafts, particularly fascia lata, are preferred due to their high biocompatibility and low immunogenicity. **Methods:** We present two cases of dural defect reconstruction using an autologous fascia lata graft combined with a vascularized scalp flap. Indications, surgical technique, and postoperative outcomes were analyzed. **Results:** Both patients exhibited favorable healing without recurrence of CSF leakage or infection. The fascia lata graft showed satisfactory integration, and coverage with vascularized tissue enhanced healing and resistance to infection. **Conclusion:** Autologous fascia lata is a safe and effective alternative to synthetic dural substitutes, particularly in contaminated or high-risk environments. Its combination with a vascularized flap improves the durability and quality of dural closure.

**KEYWORDS:** Fascia lata; Autograft; Scalp flap; Dural defect; Dural substitute; Cranial reconstruction.

## INTRODUCTION

Dural defect repair following surgical resection is essential to restore the meningeal barrier and prevent contamination of the central nervous system. Various types of dural substitutes have been described over the years. Autologous grafts, such as fascia lata or deep temporal fascia, remain the materials of choice due to their excellent biocompatibility and low immunogenicity.<sup>[1,2,3]</sup> However, their use is limited by the availability of donor tissue and the morbidity associated with the harvesting site. To overcome these limitations, synthetic dural substitutes have been introduced.<sup>[18,22,4,13,5]</sup> In cranial reconstructions—particularly at the skull base—the role of the dural substitute is critical for separating the intracranial cavity from the paranasal sinuses. Preventing cerebrospinal fluid (CSF) fistulas and meningeal infections requires a watertight and durable closure, preferably using autologous tissues.<sup>[3]</sup> These are often reinforced with vascularized flaps (e.g., galeal flap or free musculocutaneous flap), which enhance local vascularity and promote healing.<sup>[5]</sup> Although alloplastic materials are widely available, they remain associated with a higher risk of infection, particularly in septic conditions.<sup>[5]</sup> The main indications for dural substitution include prevention of CSF leaks<sup>[13]</sup>, protection against cerebral or spinal herniation, reduction of cortico-dural adhesions, and preparation for delayed cranioplasty. The ideal dural substitute should be biologically inert, non-toxic,

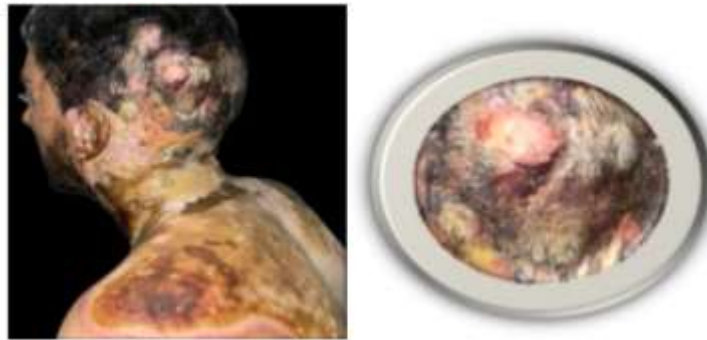
mechanically resistant, elastic, suturable, readily available, cost-effective, and easy to handle.<sup>[20]</sup>

In this context, we report two cases of dural repair using an autologous fascia lata graft combined with a scalp coverage flap, treated in our department. This study highlights the indications, surgical technique, and postoperative outcomes observed.

## CASE REPORT

## Clinical Case 1

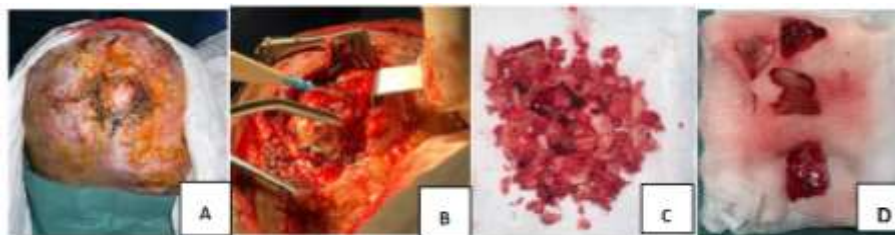
A 30-year-old male patient with a history of intravenous drug use was admitted on post-injury day 13 following a firework-related gunshot trauma sustained during an assault. Clinically, he presented with a complex scalp and calvarial soft tissue defect in the left occipito-parietal region, resulting in meningeal exposure. This was associated with an extensive area of necrosis involving the posterior neck, the upper back, and the left ear (Figure 1).



**Figure 1: Scalp defect with dural exposure and cerebrospinal fluid (CSF) leakage, associated with a softened necrotic plaque.**

The first operative step consisted of careful debridement and meticulous removal of bone fragments using a rongeur, following the contours of the defect to

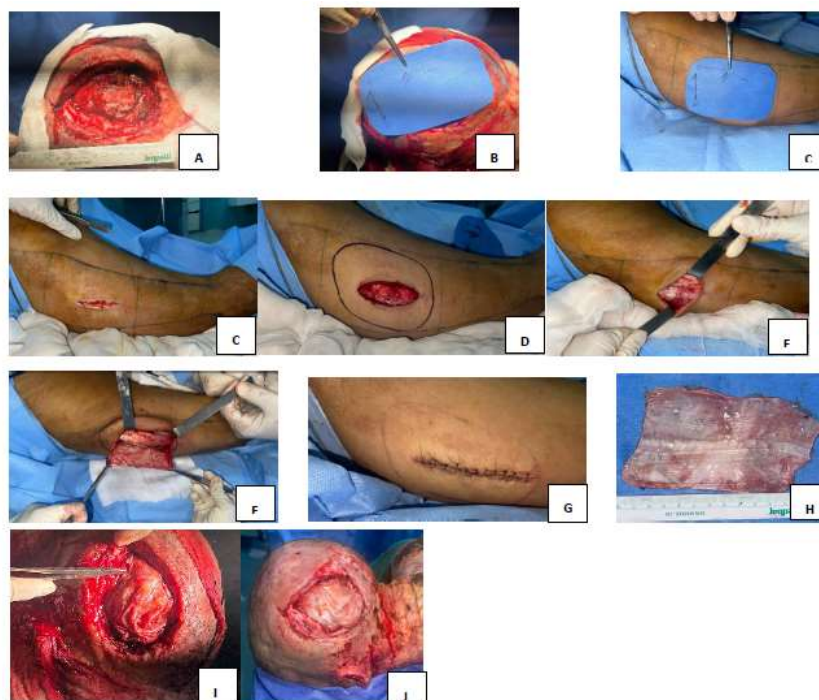
identify the peripheral margins of the dura mater (Figure 2).



**Figure 2: A: Shaving of the surgical area; B: Debridement; C–D: Removal of bone fragments using a rongeur.**

The second operative stage involved harvesting the fascia lata according to a predefined pattern, extending from the anterior superior iliac spine to the lateral femoral epicondyle. The graft was then sutured to the

dura mater at the recipient site. This step also included necrosectomy of the parieto-occipital region, retroauricular area, and the left ear (Figure 3).



**Figure 3:**

A–B: Template of the dural defect measuring 10 × 9 cm;

C: Fascia lata harvest planning based on anatomical landmarks—anterior superior iliac spine (ASIS), lateral femoral epicondyle, and posterior border of the greater trochanter;

D–E: Skin incision and subcutaneous dissection;  
 F–G: Identification and exposure of the fascia lata;  
 H: Two-layer closure with drain placement at the donor site;  
 I: Fixation of the fascia lata graft to the recipient dura using 4-0 Vicryl sutures;  
 J: Necrosectomy of devitalized tissues.

A cutaneous coverage of the osseocutaneous defect and dural plasty, measuring  $12 \times 10$  cm, was performed using a pedicled bucket-handle flap based on both anterior and

posterior temporal arteries, with a semi-thick skin graft taken from the donor site (Figure 4).



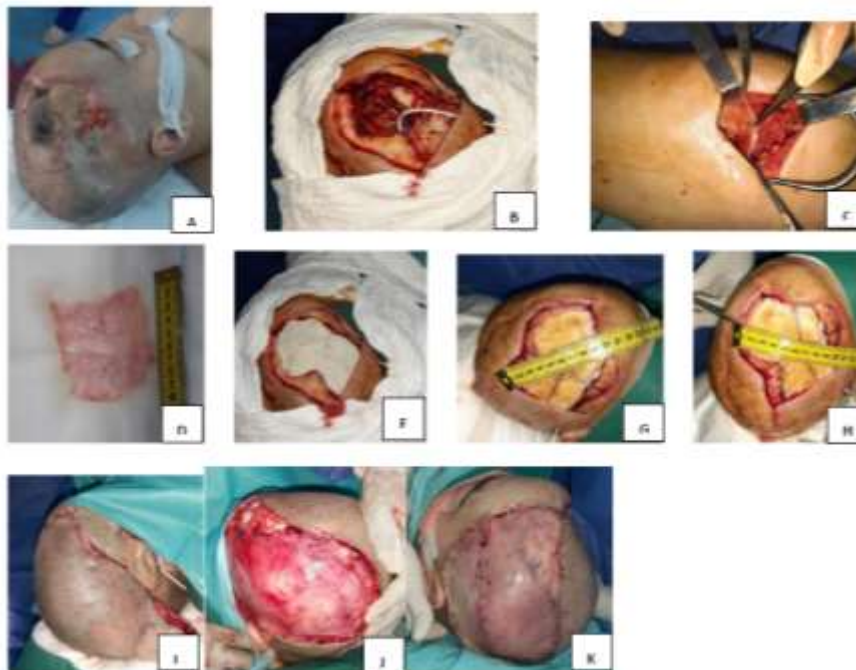
**Figure 4:**

A–B: Osseocutaneous defect and dural plasty; C–D: Flap marking and design;  
 E: Incision and dissection;  
 F–G: Flap fixation using 3-0 nylon sutures; I: Application of a semi-thick skin graft.

### Clinical Case 2

A 35-year-old female patient, previously operated on for an oligodendroglioma in 2003, with recurrence in 2006 and 2022, treated with surgical resection combined with radio- chemotherapy, developed radiation dermatitis progressing to a tissue defect associated with osteitis.

The patient underwent tumor excision, fascia lata grafting, cranioplasty, and coverage with a transposition flap based on the occipital artery, along with grafting from the donor site. (Figure 5)



**Figure 5:**



A: Radiation dermatitis lesion, fronto-temporal region;  
 B: Excision;  
 C,D: Fascia lata harvesting;  
 E: Cranioplasty using cement;  
 F,G: Measurement of the 9x11 cm template;  
 I,J: Flap harvesting and fixation;  
 K: Application of a semi-thick skin graft at the donor site

## DISCUSSION

The **fascia lata** is widely recognized as a preferred autologous dural substitute in various neurosurgical procedures, owing to its numerous biological and mechanical advantages. Its use is based on several key benefits. As an autologous tissue, it is non-immunogenic, resulting in minimal inflammatory response and preventing rejection. These properties make fascia lata a first-choice material, particularly in clinical settings.<sup>[4,22]</sup>

From a mechanical standpoint, fascia lata offers **strength** and **flexibility** comparable to the **native dura mater**.<sup>[15]</sup> These properties facilitate **secure suturing** across the entire defect, ensuring the integrity of the meningeal barrier, even under conditions of elevated intracranial pressure. Additionally, the structural compatibility of fascia lata with the dura mater promotes **rapid tissue integration**, which contributes to **graft stability** and **revascularization**.<sup>[7,14]</sup>

In cranial dural reconstructions, fascia lata is particularly useful in effectively separating the intracranial cavity from underlying structures, such as the sinuses or nasal cavity. It aids in preventing **cerebrospinal fluid (CSF) leaks** and reduces the risk of **meningeal infections**, a common complication in such surgeries. **Autologous fascia lata grafts** are therefore often preferred over artificial substitutes due to their superior **biocompatibility** and ability to promote **rapid healing**.<sup>[20,3]</sup>

The addition of **vascularized flaps** (such as galeal or free myocutaneous flaps) to the repair site significantly enhances **local vascularization** and accelerates the **healing process**, further improving the effectiveness of the repair and reducing the risk of postoperative complications, including infections and graft loss.<sup>[21,12]</sup>

In contrast, while **alloplastic substitutes** (such as synthetic grafts) are widely used, their potential for tissue integration is often limited. These materials, although readily available and easy to manipulate, are associated with a higher **infection risk**, particularly in cases of septic contamination, which justifies the preference for autologous grafts in high-risk scenarios.<sup>[22,3]</sup>

In summary, autologous fascia lata, due to its biological and mechanical properties, represents an **effective and reliable therapeutic option** for dural defect repair, particularly in contexts where infection prevention and long-term stability are crucial.

The intrinsic properties of **fascia lata** promote its integration into surrounding tissues. It provides a histological support conducive to **revascularization**, making it a material that is well-tolerated even in **septic contexts**. Histological studies have highlighted **fibroblastic proliferation** and the formation of connective tissue fibers both on the surface and at the interfaces between the graft and the residual dura mater.<sup>[23,4,22,6]</sup> When covered with a well-vascularized tissue, this healing process is significantly accelerated. Mello et al.<sup>[5]</sup> demonstrated that a cellulose implant was encapsulated within 30 days by two distinct layers of connective tissue, highlighting the rapid tissue response.

Our observations confirm these findings. In our series, **fascia lata** grafts demonstrated rapid and robust healing when associated with coverage by a well-vascularized flap, compared to synthetic grafts such as **EPTFE** (expanded polytetrafluoroethylene). The latter, although encapsulated by a thin fibrous layer, showed limited adhesion to the adjacent dura mater, even at two weeks post-operatively. In the absence of flap coverage, fascia healing was still possible but occurred notably slower. These results suggest that **surface vascularization** is a key factor in the quality and speed of **dural repair**.<sup>[20,21]</sup>

In secondary cranioplasties, persistent oozing has been observed at the surface of certain **fascia lata** implants, necessitating perioperative hemostatic measures. This phenomenon was also reported by Callovini et al.<sup>[8]</sup>, who, through follow-up **CT scans**, observed a progressive and homogeneous improvement of the transplanted fascia, reflecting a continuous **neovascularization** process. These data suggest that the free **fascia lata** can be nourished both by the peripheral dura mater and the overlying scalp, which would enhance its resistance to infections, even in severe infectious contexts caused by **multidrug-resistant pathogens**. Based on these observations, we emphasize that **fascia lata** should be considered not only as a sealing material but also as a substrate promoting biological healing. However, to ensure its viability, it must be covered by well-vascularized tissue. In cases of skin deficiency or compromised scalp, especially after infection or irradiation, a **pedicled temporal muscle flap** may be mobilized to provide this coverage.<sup>[23]</sup>

The success of these reconstructions does not solely depend on the surgical repair itself. It requires a comprehensive approach that includes meticulous postoperative management, focused on eradicating the responsible pathogens. This management relies on

appropriate antibiotic therapy, often guided by individualized antibiograms. However, **multidrug-resistant (MDR)** and **extensively drug-resistant (XDR)** strains significantly reduce the available therapeutic options. In this context, **colistin**, rediscovered in the 2000s, remains one of the few effective agents against certain **enterobacteria** and **multidrug-resistant Gram-negative bacilli** involved in nosocomial **meningitis** or **ventriculitis**.<sup>[9]</sup>

Complications associated with the fascia lata harvest site, such as aesthetic scarring, knee instability, or quadriceps weakness, are documented in the literature.<sup>[31]</sup> However, in our series, no significant morbidity was observed at the donor site, which confirms the safety of the procedure when performed correctly. In accordance with the principles of infectious surgery, the implantation of synthetic dural substitutes in septic contexts is contraindicated. The need to use vascularized tissue to promote healing and limit infectious complications is now widely accepted.<sup>[4,22]</sup> Several combined surgical techniques have been described in this context. Shimada<sup>[11]</sup> used an anterolateral thigh flap containing the fascia lata to reconstruct the dura mater. Abuzayed *et al.*<sup>[13]</sup> described a technique combining autologous fascia lata with a pedicled muscle flap. Uemura reported the use of a free rectus muscle flap, while other authors have proposed the combination of a perforating fascial flap with the rectus abdominis muscle<sup>[14,5]</sup> or the use of a free latissimus dorsi muscle flap to reinforce the reconstruction.<sup>[15]</sup>

These techniques, although effective, are technically complex and often difficult to perform in fragile patients or those in advanced infectious states. They require a micro-surgical platform and an experienced team. In this context, simpler yet still effective solutions should be prioritized.<sup>[12]</sup>

## CONCLUSION

Fascia lata grafting is an appropriate option for the repair of dural defects when the surrounding autologous tissue at the surgical site is inadequate. It is a straightforward procedure with no short- or long-term complications.

## Conflict of Interest Statement

The authors declare no conflicts of interest related to this work.

## REFERENCES

1. DONG, Rong-Peng, ZHANG, Qi, YANG, Li-Li, *et al.* Clinical management of dural defects: a review. *World journal of clinical cases*, 2023; 11(13): 2903.
2. GEORGE, Bernard, FERRARIO, Cristina Anastasia, BLANQUET, Alexandre, *et al.* Cavernous sinus exenteration for invasive cranial base tumors. *Neurosurgery*, 2003; 52(4): 772-782.
3. TACHIBANA, Eiji, SAITO, Kiyoshi, FUKUTA, Keizo, *et al.* Evaluation of the healing process after dural reconstruction achieved using a free fascial graft. *Journal of neurosurgery*, 2002; 96(2): 280-286.
4. BI, Xuewei, LIU, Bo, MAO, Zhinan, *et al.* Applications of materials for dural reconstruction in pre-clinical and clinical studies: Advantages and drawbacks, efficacy, and selections. *Materials Science and Engineering: C*, 2020; 117: 111326.
5. SHEN, Ming, QIAO, Nidan, SHOU, Xuefei, *et al.* Collagen sponge is as effective as autologous fat for grade 1 intraoperative cerebral spinal fluid leakage repair during transsphenoidal surgery. *Clinical neurology and neurosurgery*, 2022; 214: 107131.
6. SCHMALZ, Philip, GRIESSENAUER, Christoph, OGILVY, Christopher S., *et al.* Use of an absorbable synthetic polymer dural substitute for repair of dural defects: a technical note. *Cureus*, 2018; 10: 1.
7. AZZAM, Daniel, ROMIYO, Prasanth, NGUYEN, Thien, *et al.* Dural repair in cranial surgery is associated with moderate rates of complications with both autologous and nonautologous dural substitutes. *World neurosurgery*, 2018; 113: 244-248.
8. CALLOVINI, Giorgio M., BOLOGNINI, Andrea, CALLOVINI, Tommaso, *et al.* Treatment of CSF leakage and infections of dural substitute in decompressive craniectomy using fascia lata implants and related anatomopathological findings. *British journal of neurosurgery*, 2021; 35(1): 18-21.
9. DE BONIS, Pasquale, LOFRESE, Giorgio, SCOPETTUOLO, Giancarlo, *et al.* Intraventricular versus intravenous colistin for the treatment of extensively drug resistant *Acinetobacter baumannii* meningitis. *European journal of neurology*, 2016; 23(1): 68-75.
10. DI SUMMA, Pietro G., SAPINO, Gianluca, CHERUBINO, Mario, *et al.* Reconstruction of complex soft tissue defects including tendons with anterolateral thigh flap extended to fascia lata: long term recovery and functional outcomes. *Microsurgery*, 2019; 39(5): 405-415.
11. NAKANO, Takashi, YOSHIKAWA, Katsuhiro, KUNIEDA, Takeharu, *et al.* Treatment for infection of artificial dura mater using free fascia lata. *Journal of craniofacial surgery*, 2014; 25(4): 1252-1255.
12. ZHANG, Feng, ZENG, Tao, GAO, Liang, *et al.* Treatment of traumatic cerebrospinal fluid rhinorrhea via extended extradural anterior skull base approach. *Chinese Journal of Traumatology*, 2021; 24(05): 280-285.
13. ABUZAYED, Bashar, KAFADAR, Ali Metin, OGUZOGU, Söhret Ali, *et al.* Duraplasty using autologous fascia lata reenforced by on-site pedicled muscle flap. *Journal of craniofacial surgery*, 2009; 20(2): 435-438.
14. SUNG, Kwon Soon et HAK, Chang. Staged reconstruction of infected dura mater using vascularized rectus abdominis muscle. *Journal of Craniofacial Surgery*, 2012; 23(6): 1741-1743.

15. BARRIENTOS, Stephan, LEIF, Marilyn, HON, Heidi H., *et al.* Duraplasty using autologous fascia lata and latissimus dorsi free flap for chronic cerebrospinal fluid leak. *Journal of craniofacial surgery*, 2019; 30(7): e671-e674.
16. CHANG, David W., LANGSTEIN, Howard N., GUPTA, Abhay, *et al.* Reconstructive management of cranial base defects after tumor ablation. *Plastic and reconstructive surgery*, 2001; 107(6): 1346-1355.
17. TACHIBANA, Eiji, SAITO, Kiyoshi, FUKUTA, Keizo, *et al.* Evaluation of the healing process after dural reconstruction achieved using a free fascial graft. *Journal of neurosurgery*, 2002; 96(2): 280-286.
18. LAQUERRIERE, Annie, YUN, Jin, TIOLLIER, Jérôme, *et al.* Experimental evaluation of bilayered human collagen as a dural substitute. *Journal of neurosurgery*, 1993; 78(3): 487-491.
19. RANGEL-CASTILLA, Leonardo, RUSSIN, Jonathan J., *et* SPETZLER, Robert F. Surgical management of skull base tumors. *Reports of Practical Oncology and Radiotherapy*, 2016; 21(4): 325-335.
20. THAMMAVARAM, Krishna V., BENZEL, E. C., *et* KESTERSON, L. Fascia lata graft as a dural substitute in neurosurgery. *Southern medical journal*, 1990; 83(6): 634-636.
21. THAKKER, Jayini S. *et* FERNANDES, Rui. Evaluation of reconstructive techniques for anterior and middle skull base defects following tumor ablation. *Journal of Oral and Maxillofacial Surgery*, 2014; 72(1): 198-204.
22. YE, Jiajing, HONG, Zhenghua, CHU, Binxiang, *et al.* Comparison of dural closure methods for dural repair to reduce the incidence of cerebrospinal fluid leakage. *British Journal of Neurosurgery*, 2024; 38(3): 668-673.
23. ZENG, Tao, WANG, MingSheng, XU, Zijun, *et al.* Autologous free fascia lata can be used as dura graft in the salvage treatment of recalcitrant postcraniotomy intracranial infection caused by multidrug-resistant gram-negative bacteria. *Infection and Drug Resistance*, 2022; 5667-5677.