Donor Site Morbidity of Iliac Crest Bone Graft in Maxillofacial Surgery

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ABSTRACT

Objective: To evaluate the frequency and progression of acute and chronic morbidities associated with the iliac crest bone graft donor site.
Study Design: Descriptive, longitudinal study.
Place and Duration of the Study: Department of Oral and Maxillofacial Surgery, Ziauddin Medical University and Hospital, Karachi, Pakistan, from August 2024 to March 2025.
Methodology: Forty-five patients undergoing reconstructive maxillofacial surgery with iliac crest bone grafts were included. Patients aged between 18 and 60 years, with no chronic pain disorders or bone pathologies, were enrolled. Pain levels were assessed using the visual analogue scale (VAS), and other morbidities were evaluated through clinical examination and a structured questionnaire. Statistical analysis was performed using descriptive statistics with SPSS version 20.0.
Results: Among the 45 patients, 39 (87%) reported pain on the seventh postoperative day. Other acute morbidities included haematoma in 8 (18%) patients, acute nerve injury in 10 (22%) patients, and infection in 3 (7%) patients. Chronic pain persisted in 27 (60%) patients for one month, 12 (14%) patients for two months, and 4 (9%) patients for three months. Nerve injury was recorded in 6 (13%) patients at the first month, 4 (9%) patients at the second month, and had fully resolved by the third month.
Conclusion: Pain was the most frequently reported donor site morbidity, peaking in the early postoperative period and persisting at a moderate level up to the third month. In contrast, nerve injury showed a consistent decline and had resolved completely by the third month. These findings underscore the importance of implementing effective postoperative pain management strategies to support recovery and improve patient outcomes following iliac crest bone grafting.

Key Words: *Donor site morbidity, Autologous bone graft, Postoperative complications, Nerve injury, Visual analogue scale*.

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INTRODUCTION

Bone is a specialised tissue that undergoes continuous renewal throughout life. However, bone defects can develop due to serious fractures, non-healing fractures, infections, severe osteoporosis, or bone cancers. To address these defects, bone grafts and substitutes are frequently employed to fill bony voids and restore structural integrity. The bone grafts play a crucial role in oral and maxillofacial surgery, trauma, and orthopaedic surgery, helping to promote bone healing and regeneration.[1]

Autografts, allografts, xenografts, and synthetic substitutes are commonly used in clinical settings. Autografts are considered the gold standard due to their osteogenic potential, but are limited by donor site morbidity and availability.

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Allografts and xenografts offer alternatives but carry risks of disease transmission and immunogenic reactions. Synthetic bone grafts, such as those incorporating nanotechnology and 3-D printing, have gained attention for their potential to overcome these limitations by mimicking the natural bone healing process more closely and promoting faster and more complete regeneration.[2] Bone grafts can be harvested from various parts of the body, such as the femur or fibula. Non-vascularised bone grafts are primarily taken from endochondral bones or membranous-origin bones for reconstruction, secondary alveolar grafting, implantology, and craniofacial defects.[3] However, the iliac crest is considered as the optimal source due to the large volume of bone it provides. The iliac crest has long been regarded as the gold standard for the above reason.[4] It is easily accessible, provides a reasonable amount of bone, and allows simultaneous performance of oral procedures.[5] The use of iliac crest bone grafts in maxillofacial surgery has a rich historical background.[6-8] Initially, this technique was primarily used in orthopaedic surgery. However, as the field of maxillofacial surgery evolved, surgeons recognised the potential of iliac crest grafts for addressing craniofacial bone defects.[9] Today, the autologous bone grafting is a common practice for treating bone defects caused by tumours, injuries, or persistent infec-

tions.[10] The first recorded bone transplant was performed by the Flemish Surgeon Job van Meekeren (1611–1666), who successfully implanted a piece of dog skull bone into a human skull.[11]

While selecting the most suitable donor site for autologous bone grafting, surgeons must carefully evaluate the size of the bone defect, the biomechanical characteristics of the graft, the ease and accessibility of harvest, and the potential for donor site morbidity.[12] However, donor site morbidity, including pain, gait disturbances, and sensory deficits, continues to be a concern. A systematic review and meta-analysis by McKenna *et al*. reported that iliac crest grafts are frequently associated with donor site complications such as pain/discomfort, gait disturbance, and sensory disturbance.[13] In elderly patients, postoperative morbidity can be more pronounced. A retrospective study by Katz *et al*. involving 486 patients found that while major complications were rare, minor complications such as gait disturbances and hypoesthaesia occurred, with the volume of the graft correlating with longer hospital stays.[6]

Furthermore, innovative techniques are being explored to mitigate donor site pain. A study by Yorukoglu *et al*. introduced the anterior iliac block (AIB) technique, demonstrating effective postoperative analgesia for anterior iliac crest bone graft harvesting.[14]

Despite advancements in surgical techniques and perioperative care, there is still a significant lack of standardised contemporary data regarding donor site morbidity associated with iliac crest bone graft harvesting. Variability in reported outcomes, particularly in terms of pain and sensory deficits, limits the development of evidence-based guidelines for surgical planning and postoperative management.

This study addresses that gap by systematically documenting the frequency, severity, and progression of donor site complications over a defined follow-up period in a specific patient population. The findings aim to contribute to standardised postoperative protocols, enhance patient safety, and support more informed clinical decision-making in maxillofacial reconstructive surgery.

METHODOLOGY

A descriptive longitudinal study was conducted in the Department of Oral and Maxillofacial Surgery, Ziauddin Medical University and Hospital, Karachi, in Clifton, North Nazimabad, and Keamari Campuses, from August 2024 to March 2025, with the approval of the Institutional Review Board (IRB) of Ziauddin University (Reference Code: 8850724BTOM, Dated; 17 August, 2024). The patients' informed consent was obtained prior to study enrolment. The sample size (n = 45) was calculated using the OpenEpi software, considering a confidence level of 95% and 5% margin of error, and an estimated prevalence of 3% for infection based on prior literature.[15] A total of 45 patients undergoing reconstructive maxillofacial surgery with iliac crest graft were enrolled from the OPD. Patients included in this study were aged between 18 and 60 year and were undergoing reconstructive maxillofacial surgery with an iliac crest graft. All participants were required to be fit for surgery under general anaesthesia. Patients were excluded if they had chronic pain disorders, pelvic surgery, active infection, inability to provide informed consent, blood disorders such as anaemia, thrombocytopenia, or neutropenia, or were taking immunosuppressive medicines, including long-term steroids. Additionally, patients with bone pathologies such as osteoporosis were excluded from the study.

Following the collection of medical history, clinical examination, baseline investigations, and general anaesthesia fitness, the patient's operation was scheduled. Iliac crest bone graft was harvested by a standard technique.[16] The patient was placed in a supine position with a bolster under the gluteal region of the donor side. After standard skin preparation and draping, an incision was made approximately 3 cm posterior to the anterior superior iliac spine along the subcutaneous border of the iliac crest. The skin was stretched medially to prevent scar formation over the bony prominence. The incision length varied based on the graft size required. Soft tissue was incised and subperiosteally stripped from the lateral iliac surface, while attachments on the superior surface were preserved. A myo-osseous flap, including periosteum, abdominal, and iliacus muscle, was elevated and retracted with Ellis forceps. A tricortical graft was harvested by cutting both cortical plates with an osteotome or saw, followed by gentle prying. Following graft harvest, the flap was repositioned and sutured, maintaining iliac contour. The wound was closed in layers and dressed appropriately. The use of a gauze and foam tape compression dressing was done to stop the formation of postoperative seroma. Patients were discharged on the third postoperative day on oral medications, including tablet Amoxicillin and Clavulanate 625 mg TDS, tablet Naproxen Sodium 550 mg BD, tablet Metronidazole 400 mg TDS, and the tablet Omeprazole 40 mg OD for 7 days.

Patients were called for follow-up on the seventh postoperative day to assess acute complications, including pain, haematoma, infection, and nerve injury. Further assessments were conducted at the first, second, and third months postoperatively to evaluate chronic pain and nerve injury.

Clinical examination was performed at each visit using the following assessment criteria: Pain was evaluated using the VAS, ranging from 0 (no pain) to 10 (worst possible pain). Pain severity was categorised as mild (1–3), moderate (4–6), or severe (7–10). Nerve injury was assessed through sensory testing over the distribution of the lateral femoral cutaneous nerve, using a light touch. Clinical indicators included numbness, tingling, or paraesthesia. Haematoma was diagnosed through inspection and palpation of the donor site. Indicators included localised swelling, discolouration (ecchymosis), and a soft fluctuant mass, suggesting subcutaneous blood accumulation. Infection was identified through the presence of erythema, warmth, purulent discharge, tenderness, or fever (>38°C) on systemic review.

The statistical analysis was conducted using SPSS version 20. Descriptive statistics were utilised to summarise the demographic characteristics and donor site morbidities. Continuous variables, such as age, were reported as mean ± standard deviation (SD), while categorical variables (pain, nerve injury, infection, and haematoma) were expressed as absolute frequencies and percentages.

RESULTS

A total of 45 patients underwent anterior iliac crest bone grafting for maxillofacial reconstruction and were included in the study. The mean age of the patients was 40.01 ± 9.44 years, with an age range of 18 to 60 years (Table I).

Pain was the most frequently reported acute donor site complication. On the seventh postoperative day, 39 (87%) patients experienced pain at the donor site. Among these, 23 (51%) patients reported moderate pain and 16 (36%) patients reported severe pain based on the VAS (Table II). Only 6 (13%) patients were pain-free at this stage.

Haematoma was observed in 8 (18%) patients, presenting as localised swelling and discolouration over the donor region. Acute nerve injury was reported in 10 (22%) patients, primarily presenting with numbness or tingling in the distribution of the lateral femoral cutaneous nerve. Postoperative wound infection was diagnosed in 3 (7%) patients, based on clinical signs such as erythema, warmth, tenderness, and discharge.

Table I: Age characteristics.

No. of patients	Minimum age (years)	Maximum age (years)	Mean ± SD
45	18	60	40.01 ± 9.44

Table II: Frequencies of donor site morbidities of iliac crest bone graft.

Morbidities	Present (frequency) n = 45	Percentage (%)
Acute morbidities (7th day postoperative)		
Acute pain	39	87%
No pain	6	13%
Moderate pain	23	51%
Worst pain	16	36%
Haematoma	8	18%
Acute nerve injury (7th day postoperative)	10	22%
Infection (7th day postoperative)	3	7%
Chronic morbidities		
Chronic pain (1st month)	27	60 %
No pain	18	40 %
Moderate pain	19	42 %
Worst pain	8	18 %
Chronic pain (2nd month)	12	14 %
No pain	33	38 %
Moderate pain	9	10 %
Worst pain	3	3 %
Chronic pain (3rd month)	4	9 %
No pain	41	91 %
Moderate pain	3	7 %
Worst pain	1	2 %
Nerve injury		
1st month	6	13 %
2nd month	4	9 %
3rd month	0	0 %

Chronic pain was evaluated at follow-up intervals of the first, second, and third months. At the first month follow-up, 27 (60%) patients reported persistent pain. Among them, 19 (42%) patients had moderate pain, and 8 (18%) patients experienced severe pain. At the second month, the number of patients reporting pain decreased to 12 (27%), with 9 (20%) experiencing moderate pain and 3 (7%) reporting mild pain.

By the third month, only 4 (9%) patients continued to report pain, with 3 (7%) experiencing mild discomfort and 1 (2%) patient reporting severe pain. This progressive reduction in pain over time reflects a typical recovery pattern following iliac crest harvesting.

Nerve injury was noted in 6 (13%) patients at the first month review, evidenced by sensory disturbances such as numbness and paraesthesia. This number declined to 4 (9%) patients at the second-month follow-up, and by the third month, all patients had recovered with no residual sensory deficits.

DISCUSSION

In this series of 45 patients, donor-site pain was the predominant complication of iliac crest harvesting. On postoperative day 7, 39 (87%) patients reported pain (mostly moderate). Pain decreased substantially over time: Twenty-seven (60%) patients had pain in the first month and only 4 (9%) in the third month. Other acute morbidities were less common: Haematomas occurred in 8 (18%) patients, sensory (lateral femoral cutaneous nerve) disturbances in 10 (22%), and superficial infections in 3 (7%). Notably, all sensory deficits resolved by the third month were observed.

These findings are broadly in line with recent literature. Boehm *et al*. reported very low rates of chronic pain (3.1%) and infection (1.0%) after iliac crest grafting,[17] while Schott *et al*. found late donor-site pain in only 4.2% of paediatric patients.[18] In the present cohort, the incidence of chronic pain (9%) and infection (7%) was higher, possibly reflecting differences in technique or patient factors. A study conducted by Khan *et al*. showed that more than 50% of enrolled cases reported mild pain at one-month postoperative follow-up.[19] A study by Clarke *et al*. found that 89% of patients had no pain at three-month postoperative follow-up, aligning with the present study's findings.[20] Variability in reported morbidity underscores the need for refined surgical techniques and postoperative care. Innovations to reduce donor-site pain have been explored. For example, Yorukoglu *et al*. described an ultrasound-guided AIB that significantly improved pain control in the first 24 hours' post-harvest.[14] Li *et al*. showed that closed-suction drainage at the donor site can reduce wound complications without increasing pain.[21] Alternative graft sites are also considered. Uzodimma *et al*. reported that proximal tibial grafts led to significantly less early postoperative pain than iliac grafts.[22]

A limitation of this study was its lack of a comprehensive quality-of-life assessment beyond pain and sensory disturbances. Future research should incorporate functional outcomes to improve patient management. Comparative analysis with

other studies shows variability in the incidence of complications associated with iliac crest grafting, pointing to the need for tailored patient management and surgical practices. The observed morbidities, particularly pain and sensory disturbances, can affect functional recovery and overall patient satisfaction, underscoring the importance of improving surgical and postoperative protocols.

CONCLUSION

Anterior iliac crest bone grafting for maxillofacial reconstruction provides ample autogenous bone but is accompanied by notable donor-site morbidity. Postoperative pain is the most common complaint, generally peaking in the first week and subsiding by three months, whereas sensory and other complications were relatively infrequent and resolved over time. These findings emphasise the importance of optimising perioperative pain management. With few serious complications observed, efforts should concentrate on improved analgesic techniques and surgical protocols to enhance patient recovery and satisfaction.

ETHICAL APPROVAL:
The study was approved by the Institutional Review Board of Ziauddin Medical University and Hospital, Karachi, Pakistan (Reference Code: 8850724BTOM, Dated: 17 August, 2024).

PATIENTS' CONSENT:
The patients' informed consent was obtained prior to study enrolment.

COMPETING INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
BT: Conception, study design, and data collection.
NUW: Analysis and interpretation.
MIM: Conception, data acquisition, and drafting of the manuscript.
BF: Data analysis and interpretation.
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REFERENCES

1. De Pace R, Molinari S, Mazzoni E, Perale G. Bone regeneration: A review of current treatment strategies. *J Clin Med* 2025; **14(6)**:1838. doi: 10.3390/jcm14061838.
2. Nicolae CL, Pirvulescu DC, Niculescu AG, Epistatu D, Mihaiescu DE, Antohi AM, *et al*. An up-to-date review of materials science advances in bone grafting for oral and maxillofacial pathology. *Materials (Basel)* 2024; **17(19)**: 4782. doi: 10.3390/ma17194782.
3. Wang JC, Wang SY, Gui L, Wei L, Xu J. Porous polyethylene combined with split calvarial bone graft to cover complex calvarial defect. *J Craniofac Surg* 2012; **23(6)**:1802-4. doi: 10.1097/SCS.0b013e318271012a.
4. Haws L, Ma B, Godfrey T, Waite PD, Kinard BE, Powell K. Complication rates of the anterior iliac crest bone graft donor site for 426 pediatric patients undergoing Alveolar bone grafting. *J Oral Maxillof Surg* 2025. doi: 10.1016/j.joms.2025.05.006.
5. Ullah H, Qayyum Z, Jamal M, Asim M, Khan MW. Donor site morbidity after bone harvesting from iliac crest for maxillofacial region. *Pak Oral Dent J* 2018; **38(1)**:21-5. Available from: https://podj.com.pk/index.php/podj/article/view/12.
6. Katz MS, Ooms M, Heitzer M, Peters F, Winnand P, Kniha K, *et al*. Postoperative morbidity and complications in elderly patients after harvesting of iliac crest bone grafts. *Medicina (Kunas)* 2021; **57(8)**:759. doi: 10.3390/medicina57080759.
7. Cansiz E, Haq J, Manisali M, Cakarer S, Gultekin BA. Long-term evaluation of three-dimensional volumetric changes of augmented severely atrophic maxilla by anterior iliac crest bone grafting. *J Stomatol Oral Maxillofac Surg* 2020; **121(6)**:665-71. doi: 10.1016/j.jormas.2019.11.004.
8. Hanafy M, Zaki M, El Faramawi T, Nawwar A, Esmael WF, Khashaba M. Bone gain in alveolar cleft repair combining Hyaluronic acid with anterior iliac crest corticocancellous graft. *Egypt Dent J* 2023; **69(4)**:2619-25. doi: 10.21608/edj.2023.221678.2628.
9. Hampel GA, Yilmaz E, Massrey C, Clifton W, Iwanaga J, Loukas M, *et al*. History of bone grafts in spine surgery. *Cureus* 2022; **14(5)**:e24655. doi: 10.7759/cureus.24655.
10. Migliorini F, La Padula G, Torsiello E, Spiezia F, Oliva F, Maffulli N. Strategies for large bone defect reconstruction after trauma, infections or tumour excision: A comprehensive review of the literature. *Eur J Med Res* 2021; **26(1)**:118. doi: 10.1186/s40001-021-00593-9.
11. Haeseker B. Van Meekeren and his account of the transplant of bone from a dog into the skull of a soldier. *Plast Reconstr Surg* 1991; **88(1)**:173-4.
12. Kakalecik J, Raymond B, Dzieza WK, Root KT, Hao KA, Mathias RC, *et al*. Harvesting iliac crest bone graft: A narrative review and cost analysis. *J Orthop Bus* 2025; **5(1)**. doi: 10.55576/job.v5i1.61.
13. McKenna GJ, Gjengedal H, Harkin J, Holland N, Moore C, Srinivasan M. Effect of autogenous bone graft site on dental implant survival and donor site complications: A systematic review and meta-analysis. *J Evid Based Dent Pract* 2022; **22(3)**:101731. doi: 10.1016/j.jebdp.2022.101731.
14. Yorukoglu HU, Cesur S, Izgin Avci I, GoK A, Aksu C, Selek O, *et al*. Retrospective evaluation of postoperative analgesia efficacy of a new technique in anterior iliac crest bone graft harvesting: Anterior iliac block. *BMC Anesthesiol* 2024; **24(1)**:443. doi: 10.1186/s12871-024-02829-7.
15. Morais J, Azevedo M, Baptista D, Gaspar C, Zenha H, Costa H. Iliac crest free flap: A reappraisal of indications and donor site complications. *Eur J Plast Surg* 2021; **45**:293-7. doi: 10.1007/s00238-021-01870-w.
16. Pokharel RK, Paudel S, Lakhey RB. Iliac crest bone graft harvesting: Modified technique for reduction of complications. *J Nepal Med Assoc* 2022; **60(247)**:325-8. doi: 10.31729/jnma.7086.

17. Boehm KS, Al-Taha M, Morzycki A, Samargandi OA, Al-Youha S, LeBlanc MR. Donor site morbidities of iliac crest bone graft in craniofacial surgery: A systematic review. *Ann Plast Surg* 2018; **83(3)**:352-8. doi: 10.1097/SAP.0000000000001682.

18. Schott T, Eisenberg KA, Vuillermin CB, Bae DS, Waters PM, Bauer AS. Donor-site morbidity for iliac crest harvesting for pediatric scaphoid nonunion. *J Hand Surg Am* 2023; **48(8)**:833.e1-.5. doi: 10.1016/j.jhsa.2022.02.007.

19. Khan A, Jan AU, Ullah F, Waqar M, Ahmad S, Hussain S. Assessing donor site pain after iliac crest bone graft. *Ann ASH-KMDC* 2022; **27(2)**. doi: 10.58397/ashkmdc.v27i02.480.

20. Clarke A, Flowers MJ, Davies AG, Fernandes J, Jones S. Morbidity associated with anterior iliac crest bone graft harvesting in children undergoing orthopaedic surgery. *J Child Orthop* 2015; **9(5)**:411-6. doi: 10.1007/s11832-015-0698-0.

21. Li Y, Yang S, Yang H, Lian X, Hou Z. Drain *versus* no-drain at the donor sites of iliac crest bone graft: A retrospective study. *J Orthop Surg Res* 2024; **19(1)**:675. doi: 10.1186/s13018-024-05147-3.

22. Uzodimma SC, Eyichukwu GO, Iyidobi EC, Ede O, Nwadinigwe CU, Ikeabbah HC, *et al*. Early bone graft donor site morbidities; anterior superior iliac crest *versus* proximal tibia. *Musculoskelet Surg* 2025; **109(2)**:207-12. doi: 10.1007/s12306-024-00865-7. Erratum in: *Musculoskelet Surg* 2025; **109(2)**:213. doi: 10.1007/s12306-025-00880-2.