

## Donor Site Morbidity after Anterior Iliac Bone Graft Harvesting

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### Introduction

Bone substitutes are being increasingly used especially in oncologic surgery, traumatology, revision prosthetic surgery and spine surgery. Bone substitute can be defined as a synthetic, inorganic or biologically organic combination which can be inserted for the treatment of a bone defect instead of autogenous or allogeneous bone [1]. Bone loss persists to be an important challenge in surgery, and many alternatives are available. Despite the improvement of research, human bone grafts persist to be the most effective bone substitutes to replace bone loss.

Autogenous bone graft is recognized as the standard for bone grafting in orthopaedic procedures. Bone grafts perform one or more physiologic mechanism such as osteogenesis, osteoinduction, osteoconduction. Iliac crest bone graft is the most frequent autograft [2]. Its popularity is attributable to its osteoconductive and osteoinductive properties [3]. The iliac crest remains the preferred donor site when an autograft is used, as it provides good quantities of cortical and cancellous bone [4]. There are various methods of graft harvesting from iliac crest- graft from outer cortex, graft from inner cortex, wolfe-

kawamoto's method, tricortical graft, "trap-door" technique, "table-splitting" method and trephine technique [5]. Several studies have documented morbidity and prolonged pain following iliac crest bone graft harvesting in adults and others morbidity such as seroma, hematoma, neuroma of the lateral femoral cutaneous nerve, infection, numbness, chronic pain, cosmetic deformity, fracture, and hernia also reported [6]. The objective was to analyze donor site morbidity associated after iliac crest bone graft harvesting.

### Case report

This research was retrospective study conducted in consecutive sampling in Sardjito General Hospital Yogyakarta from January 2014 to December 2018. Patients underwent anterior iliac crest bone graft harvesting was included. 4 months after the procedure, the donor site morbidity was identified. The parameters used in this study are pain score using visual analog scale, paresthesia, and problem in walking, wound infection, scar satisfaction and major morbidity. The research process is listed (Fig. 1) and we also used the question Adapted from Pollock (2008) [7] (Fig. 2).

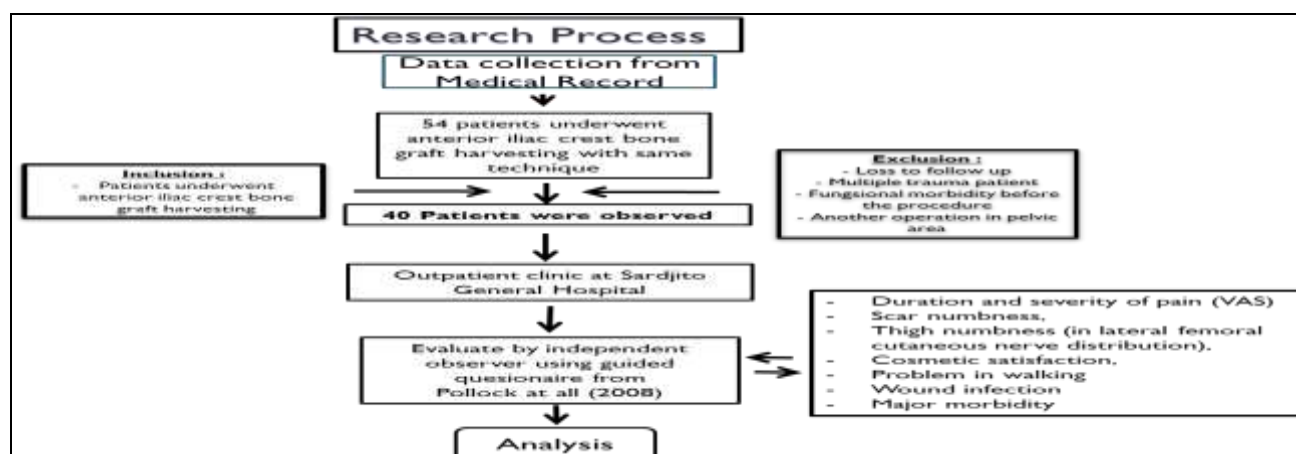


Figure 1:



### KSM ORTHOPAEDI dan TRAUMATOLOGI

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#### Lembar Kuesioner Evaluasi Pasca Tindakan Ilac Bone Graft

1. Apakah anda sampai saat ini masih merasakan nyeri di area bekas luka operasi ?

☐ Ya ☐ Tidak

2. Pertanyaan apabila masih merasakan nyeri. Dalam skala 0 – 10, berapa skor nyeri anda saat ini ?

(0 = Tidak nyeri, 10 = Nyeri paling berat)

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

3. Berapa lama anda merasakan nyeri di area luka operasi pasca dilakukan tindakan ?

☐ Tidak nyeri

☐ 0 – 2 Minggu

☐ 3 – 4 Minggu

☐ 2 – 4 Bulan

☐ 4 – 6 Bulan

☐ Lebih dari 6 bulan, bila iya berapa lama : ... Bulan

4. Apakah anda merasakan ada problem saat berjalan dikarenakan nyeri di area bekas operasi ?

☐ Tidak ada problem jalan

☐ 0 – 2 Minggu

☐ 3 – 4 Minggu

☐ 2 – 4 Bulan

☐ 4 – 6 Bulan

☐ Lebih dari 6 bulan, bila iya berapa lama : ... Bulan

5. Apakah anda membutuhkan alat bantu jalan ?

☐ Tidak membutuhkan

☐ 0 – 2 Minggu

☐ 3 – 4 Minggu

☐ 2 – 4 Bulan

☐ 4 – 6 Bulan

☐ Lebih dari 6 bulan, bila iya berapa lama : ... Bulan

6. Apakah anda merasakan mati rasa atau tebal – tebal di area bekas operasi ?

☐ Ya ☐ Tidak

7. Apakah anda pernah pergi ke Rumah Sakit dikarenakan adanya luka yang tidak sembuh ?

☐ Ya ☐ Tidak

8. Apakah anda merasakan hal – hal dibawah ini setelah dilakukan tindakan operasi ?

☐ Drainase luka bertahan lebih dari 1 minggu

☐ Perdarahan dari area luka

☐ Herniasi pada area luka

☐ Diharuskan minum antibiotik terkait luka pada area operasi yang tidak membaik

☐ Praktur pada area donor

9. Apakah anda merasakan puas dengan luka bekas operasi yang dihasilkan ?

☐ Sangat puas

☐ Cukup puas

☐ Puas

☐ Tidak puas

☐ Sangat kecewa

10. Apabila dibutuhkan, apakah anda bersedia untuk dilakukan tindakan operasi lagi ?

☐ Ya ☐ Tidak

Figure 2:

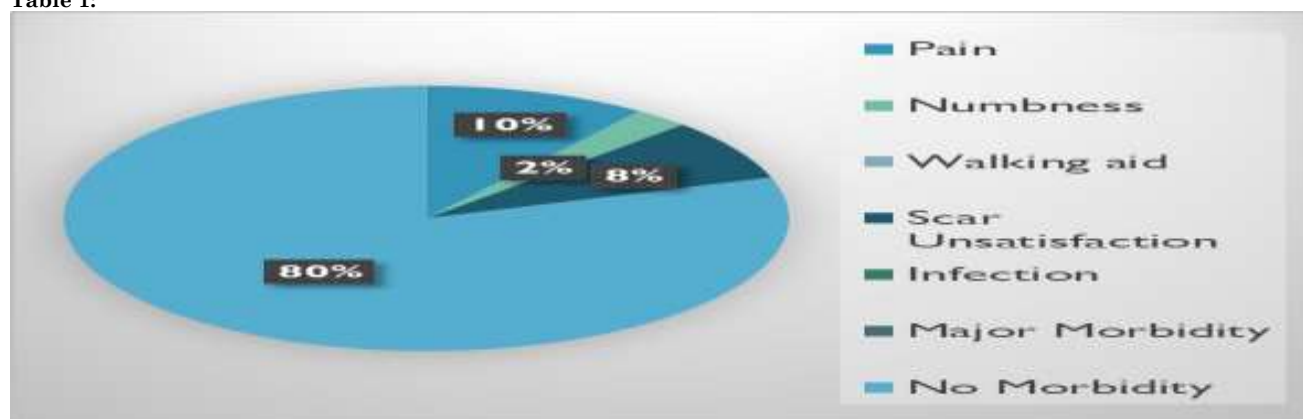
## Surgical Technique

- All harvesting was performed by same technique
- All grafts were taken by removing the inner table of the ilium from 2 cm posterior to the ASIS for a 6–8 cm distance after releasing the abdominal musculature,
- The average bone obtained was 40 cm<sup>3</sup>. The abductor insertion was left completely intact
- All donor-site incisions were closed over hemovac drain, which was left in place until output was less than 30 cm<sup>3</sup> over a 24-hour period.
- Standard antibiotic prophylaxis was given and any longer courses were based on the recipient site. Pain was managed using standard medications, both intravenous and per oral route (PO)

There were 54 patients included in this study, all of them were bicortical harvesting. 14 patients were excluded because loss to follow up. From 40 patients 16 patients were male and 24 patients were women. 80% of the subjects were adult patients. 3 patient complained scar unsatisfaction and only 4 patients complained of pain at final follow-up with all patients having a visual analog scale pain of 2-3 at final follow-up.

1 patient reported some scar numbness, however, none complained of major morbidity (Table 1). Pain is the most frequently reported complication, 4 from 40 patients complain pain with 3 of them has VAS range between 2-3, 8% of total patient complaint scar unsatisfaction. 80% of the patients complained no morbidity in donor site (Table 2).

Table 1:



	N	%
Pain	4	10
Numbness	1	2
Walking aid	-	0
Scar Unsatisfaction	3	8
Infection	-	0
Major Morbidity	-	0

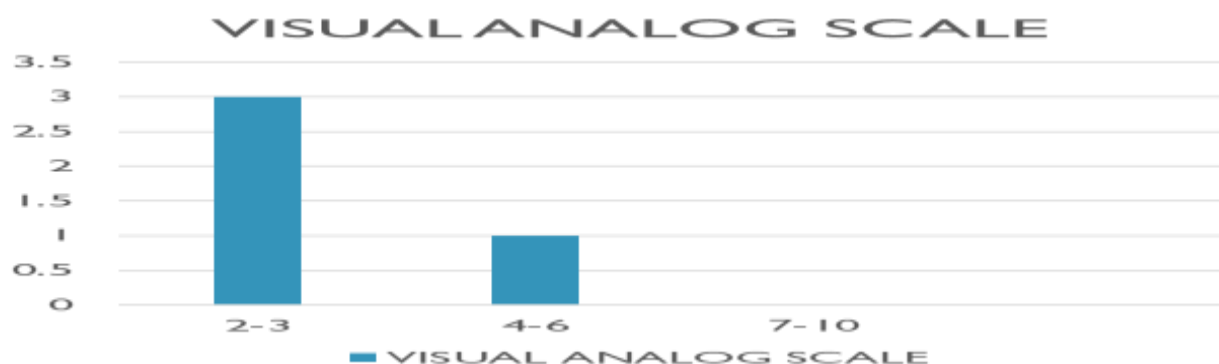


Table 2:

Scar Satisfaction	N
Extremely satisfied	10
Very satisfied	15
Somewhat satisfied	8
Neutral	4
Somewhat dissatisfied	1
Very dissatisfied	2
Extremely dissatisfied	0

## Discussion

Bone grafts are used in orthopaedic surgical procedures to provide support, fill voids and promote healing. The incorporation of a bone graft is defined as the “process of envelopment and interdigitation of the donor bone tissue with new bone deposited by the recipient” [8]. This process follows a typical

multistep cascade: initially, the bone graft produces a response leading to the accumulation of inflammatory cells, followed by the chemotaxis of host mesenchymal cells to the graft site.

Thereafter, the primitive host cells differentiate into chondroblasts and osteoblasts, a process under the influence of

various osteoinductive factors. The additional processes of bone graft revascularization and necrotic graft resorption occur concurrently. Finally, bone production from the osteoblasts onto the graft's three dimensional framework occurs, followed by bone remodeling in response to mechanical stress [9]. There are three types of bone graft: Autografts, Allografts, and Xenografts. Autograft Currently are the "gold standard" in bone substitution.

Autologous (or autogenous) bone grafting involves utilizing bone obtained from the same individual receiving the graft. Bone can be harvested from non-essential bones, such as the iliac crest or the fibula, the chin, the ribs, the mandible and even parts of the skull. Autogenous bone possesses all the properties essential for bone formation: it is osteoconductive and osteoinductive, and it houses growth factors and osteogenic cells with no associated immune or infective related risks.

Autologous bone fractures are slowly replaced by newly formed host bone. Allograft biobanked bone represents a suitable alternative to autogenous bone, being derived from humans as well. Allograft bone can be collected from either living donors (patients total hip replacement surgery) or nonliving donors and must be processed within a bone tissue bank.

Donor bone is osteoconductive, weakly osteoinductive (growth factors may still be present, depending on the processing). Also, allografts often require sterilization (gamma irradiation), with detrimental effects on mechanical properties of bone, and deactivation of proteins normally found in healthy bone. The limits of allograft such transplants are costs, laborious procedure (tissue processing, harvesting), mechanical resistance (in freeze dried and irradiated), limited osteoinduction and risk of infection.

Xenograft bone substitutes have their origin from a species other than human, such as bovine bone (or porcine bone), which can be freeze dried or demineralized and deproteinized [10]. The iliac crest remains the preferred donor site when an autograft is used, as it provides good quantities of cortical and cancellous bone, is easy to access and

possesses osteogenic, osteoconductive and osteoinductive properties. There are many reported case of morbidity after iliac crest bone graft such as seroma, hematoma, neuroma of the lateral femoral cutaneous nerve, infection, numbness, chronic pain, cosmetic deformity, fracture, and hernia.<sup>5</sup> Despite the associated donor-site morbidity, increased blood loss, operating time, and hospitalization time, iliac crest autograft is considered the gold standard because of the associated excellent fusion rates [11].

Autogenous bone grafting is the standard for bony procedures of all kinds. The current trend toward allograft bone and bone graft substitutes is laudable for its goal of decreasing morbidity. However, our data show that patients tolerate harvest from the iliac crest very well for procedures. In our study only 4 from 40 patients complained of pain at final follow-up with all patients having a visual analog scale pain of 2-3 at final follow-up.

2 patients reported some scar numbness, however, none complained of major morbidity. Pain is the most frequently reported complication, 4 from 40 patients complain pain with 3 of them has VAS range between 2-3, 8% of total patient complaint scar unsatisfaction. 80% of the patients complained no morbidity in donor site. The limitations of our study include the, the small number of patients and the retrospective study of this type of investigation is base on questionnaire.

Nonetheless, it is the patients' long-term outcomes and overall satisfaction with which we were concerned. The data truly reflect how, after several years, harvest of iliac crest bone graft did not affects patients in terms of pain and function. In addition, high response rate, and single surgeon consistency support the validity of our experience.

## Conclusion

Anterior iliac bone graft harvesting resulted in minimal morbidity and neither pain or functional limitations. It also provides the optimal bone graft material, yields minimal morbidity, and is an acceptable choice in autologous bone graft harvesting.

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