



Trap door Technique Modified after Revisiting Anatomical Features of Iliac Crest

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Abstract

The use of the autologous bone graft is since ages and the inadequacy of harvested bone graft and associated complications, some of which stay throughout the patient's life often puts the patient in significant trouble which necessitate the clinicians to search for the options which provides sufficient harvest of bone graft as well as decreasing the complications. The Trap door technique was modified after revisiting the Iliac Bone morphology and the yield in subsequent cases has increased and complications were also decreased.

Keywords: Bone Graft, Trap door., Iliac Crest.

Introduction

The harvesting of the autologous bone graft from the Iliac crest is a very common surgical procedure undertaken by the orthopaedic and reconstructive surgeons.^(1,2,3) The easy access in supine position, makes the anterior iliac crest as one of the preferred site for harvesting the autologous bone graft but the scar pain, hypertrophy, abnormal sensations, disfigurement, difficult in tying the garments pained the patient and surgeon alike.^(4,5)

To decrease the complications different techniques to harvest the bone graft have evolved⁽⁶⁾. The trap door methods of harvesting the bone graft technique maintains contour of iliac crest and bone graft can be harvested without elevating muscular attachments and a second harvest of bone graft can be had after few years^(6,7).

The problem with all bone graft harvesting techniques from anterior iliac crest is the difficulty in maintaining the balance between adequacy of cancellous bone harvested and associated complications associated with it^(1,3,8,9,10).

The Trap door technique has been successful in decreasing some of the complications associated with the anterior iliac bone graft harvesting, like loss of iliac crest contour, pain at iliac crest, and the complications associated with loss of integrity of iliac crest, but the amount of cancellous bone graft harvest remained a challenge in almost all the cases.

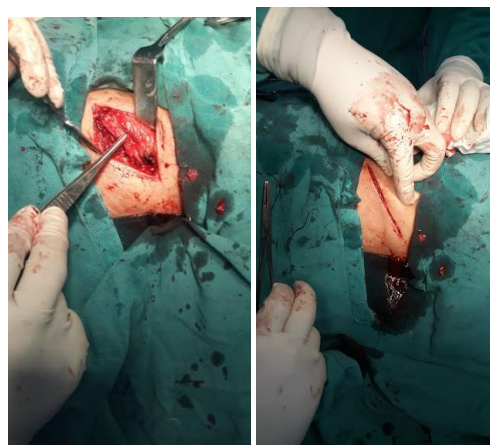
To find the solution to the challenges, anatomists help was sought and the dry human hip bone was revisited with an aim to know the best possible site for having good amount of bone graft and improve upon the methodology.

Method

Technique of trap door method of harvesting:

Patient is kept supine. With a sand bag under the hip for elevation. An incision is made 1.5 cm below the crest, approx 3 cm behind the anterior iliac crest. The lateral aspect of the crest is approached. By using osteotome 1 cm deep cut is made in the iliac crest 4 cm from iliac crest anterior and a similar posterior cut is made at the intended place depending upon the amount of bone graft harvested. A cut in the lateral blade of iliac crest is made joining the anterior and posterior cuts. With a broader osteotome inserted between the osteotomy site the osteotomized iliac crest is pushed towards iliac fossa, without erasing the attachments from inner table. At this stage, the iliac crest is available for the harvesting of cancellous bone graft available within the two tables. The gouge and curettes were used to harvest the bone graft from exposed iliac crest and under surface of the osteotomised portion of the iliac crest. The Osteotomised portion was allowed reposition to its anatomical position and the muscular attachment assisted it to fall to its natural position.

The anatomical features of iliac crest was studied after 10 cases and the changes in technique were incorporated. The anatomist was visited and the iliac crests morphology was studied for the thickest available place on iliac crest. Since bone graft from the anterior iliac crest is harvested in supine position, the pelvic bones were kept in supine positions, the wider portions over anterior iliac crest were assessed and the technique being attempted on patients was rehearsed on the dry innominate bone.



Observations and Discussion

The problems encountered in initial 10 cases of trap door method were perforation of internal table in 7 out of 10 cases. The surgeon at the end of the 10 procedure felt that he needed more graft but had to compromise for the want of more graft in all the 10 cases.

After the revisiting the morphology of iliac crest two salient features were noticed:

1. The thickest portion of the iliac crest is on average 7.5 cm away from the anterior superior iliac spine. This thickness narrows down anteriorly and posteriorly and on average the thicker portion more

than 1 cm in width available was 5.4 cm in length. The average thickest portion of the iliac tuberosity was 1.8 cm.

2. The thickened portion of the bone extending from iliac tuberosity moves towards inferior gluteal line to form the roof of acetabulum. This direction is horizontal while patient is lying supine.

After revisiting the anatomical features, the incision was centred towards the thickest portion of iliac tuberosity and the instruments for harvesting directed horizontally along the thick portion of iliac crest and ensured that in advertant vertical direction is not mistakenly followed.

In subsequent 15 patients, no perforation of the cortex has happened and the surgeon was satisfied with the amount of bone graft harvested in all the fifteen patients.

The tendency to go vertically down on iliac crest, which took us to the thinner area, leading to less harvest of bone graft and perforation of the iliac crest was avoided in subsequent cases after relearning the anatomical aspects of the iliac crest.

After the technique was modified after revisiting the anatomical features the yield of the bone graft in subsequent cases has significantly increased and the surgeon was satisfied with the amount of bone graft harvested in all 15 cases and there was no instance of the perforation of inner or outer table of iliac crest.

The trap door technique, with an inferior incision avoiding the iliac crest produces less number of complications associated with incision like scar pain, scar hypertrophy, gait disturbance, cosmetic disfigurement, anterior iliac bone fracture and abdominal hernias. Younger and Chapman has reported major and minor complications of 5.3 % and 25 % respectively⁽¹⁰⁾. Only 3 out of 25 patients have scar related significant discomfort, there was no symptoms related with lateral cutaneous nerve of thigh. There has been no case of haematoma formation or infection either.

The techniques to harvest the autologous bone grafts are continuously evolving with anterior iliac crest as common choice because of it being easy

to approach and with availability of reasonable amount of bone graft^(1,3,6,9,10). A safe anatomic zone of 35 mm in length, 10 mm in width and 30 mm in depth at the site of iliac tubercle has been reported, and our findings too match with these authors⁽¹¹⁾. This safe zone, in our opinion is bigger if we stay horizontal, and when we stay between the two lips of the iliac crest there are no chances of its perforation or fracture, obviating the complications of fracture of iliac bone.

The commonest error in our findings is the misplaced direction of the instruments which takes the surgeon towards the posterior thinner portion of the iliac crest missing the anterior thicker portion, resulting into lower yield as well as risk of perforation of the iliac crest. A refreshing of anatomical considerations by the surgeon was of great help in modifying their techniques of bone graft by the trap door method. It is strongly recommended that the surgeon should periodically revisit and refresh the anatomical features for better surgical outcomes.

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