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Piezosurgery usage in tibial bone graft harvesting- A clinical study. Oral and Maxillofacial Surgery

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ABSTRACT: Background and objective- Bone grafting procedures are common in head and neck surgery. The tibia has been recommended as a harvest site. Use of the proximal tibia as a donor site is associated with fewer complication. The various modalities employed for the harvest of block autogenous bone include the use of burs, trephines, drills and screws. This study propose to assess the use of piezosurgery for harvest of proximal tibia bone grafts to reconstruct maxillofacial defects and augment bone volume for implant based oral rehabilitation.
Materials and Method- This study was conducted on 15 patients who reported to the Dept. of Oral & Maxillofacial Surgery who required alveolar ridge augmentation using block onlay bone grafts for implant placement , who were not candidates for other ridge augmentation procedures such as ridge splitting etc. Piezosurgery was used to harvest cortico- cancellous block bone graft from the proximal tibial bone and post – operative assessment of the patient was done on 3rd, 7th ,10th day and 3 months.
Result- The result of our study show minimal pain and swelling at the donor site post – operatively and no gait disturbances or post – harvest fractures of the tibia.
Conclusion – Our study serves to summarize that Piezosurgery is an excellent tool to harvest bone grafts from the tibia with minimal complications and co-morbidity. The technique is extremely useful to harvest bone as the host site does not express any long term healing issues in terms of edema, pain on even function (gait disturbances) and the recipient site has the advantage of getting bone with increase number of viable cells.
Key Words- Piezosurgery, Autogenous bone graft, Proximal tibia.

I. INTRODUCTION

Many clinicians prefer using autogenous bone blocks or particulate bone for osseous reconstruction of the alveolar crest because of the biologic qualities, the mechanical properties and the autogenous nature of these grafts. Typical donor sites are the ramus, the chin area and the edentulous ridge segment. To create the necessary osteotomy, clinicians have used variable surgical burs or saws. These surgical instruments cut bone very effectively, however they can cause soft tissue complications such as lacerations or burns during osteotomy if the surgeon does not pay close attention. In addition these surgical devices are loud and produces macrovibration during osteotomy. The Piezosurgery device does not work on soft tissue, so that the devices causes little or no soft tissue trauma during intra- oral bone harvesting.

Now a days autogenous bone has been defined as a gold standard grafting material because of its osteoconductive, osteoinductive and osteogenic properties. Further more a major advantage of autogenous bone is lack of possible immunological reactions. Now days Oral Surgeons have moved to the newly developed Piezoelectrical bone scalpel when operating in the near vicinity of nerves or arteries. The tip of this instrument oscillates in the frequency of ultrasound. The mechanism of this device is based on the so called Piezo effect. These micro- movement at the tip are in the frequency range of 25-29 KHz, with an amplitude of 60-210 micrometer. This way only mineralized tissue is selectively cut. Neurovascular tissues and other soft tissue would only be cut by a frequency of above 50 KHz. Piezosurgery is an ultrasound device introduced in medical practice in 1988 for different procedures in application to hard tisssues including Periodontal surgery, periapical surgery, the removal of impacted teeth. Piezosurgery devices are fitted with a cooling irrigation system with 0 to 60 ml/ min. of variable sterile solution flow. The soft tissue that contacts the scalpel is not damaged, so it is an ideal device to be used in the border between soft tissue and bone thus reducing the hazards of trauma to neighbour tissue. Harvesting bone techniques and

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grafts are used to treat a myriad of pathologies including skeletal trauma, congenital defects and dental implants. There are three classic harvesting areas conducted on bone Cortical, Cancellous, Cortico-cancellous. The gold standard for harvesting cancellous bone has long been the iliac crest site. The proximal tibial bone harvest site is becoming a popular alternative to the iliac crest harvest site. The tibial plateau has seldom been recommended as a harvest site despite good accessibility and availability. There are two recognized approaches or techniques used at the anterior proximal tibia: lateral and medial. The proximal tibial harvest is now being conducted in clinical trials as an outpatient procedures. The morphology of the anterior aspect of the tibia is such that the most anterior structure is sharp and well defined borders. There are two flat surfaces that angle posteromedially and posterolateraally , which allow access for collection of cancellous bone. Hence purpose of this study is to assess the use of Piezosurgery for harvest of proximal tibial block bone grafts to reconstruct maxillofacial defects and augment bone volume for implant based oral rehabilitation.

Aim- The aim of the study is to evaluate the merits and demerits of Piezosurgery for tibial block bone graft harvesting.

Objective of this study is:

a) To evaluate the versatility and usefulness of Piezosurgery for tibial bone graft harvesting.

b) To evaluate the advantages and disadvantages of block bones harvested using Piezosurgery compared to other conventional modalities.

II. METHODOLOGY

Source of Data- This prospective study included 15 medically healthy patients in the study group, visiting the Dept. of Oral and Maxillofacial Surgery in M.R.Ambedkar Dental College and Hospital, Bangalore, who required alveolar ridge augmentation for implant rehabilitation.

Inclusion Criteria-

- Age group

between 18-50 years.

Partial/ completely edentulous maxillary & mandibular alveolar ridges.

- Insufficient alveolar bone for predictable implant restoration.

– Patient in which other bone augmentation procedures like ridge split were not indicated.

Exclusion Criteria-

- Immuno-Compromised

- Osteoporosis/bone disorders/metabolic disorders affecting bone turn over rate.

Investigations-

Pre-operative & post-operative radiographs of upper1/3 of tibia, lateral view. CBCT of jaw, Complete blood examination.

Parameters

1. Duration of Surgery.
2. Duration of post-operative pain
3. Assessment of initial healing.
4. Other complaints such as edema of lower limb.

Armamentarium-

. Sterile gloves, syringes and local anesthesia
. BP handle with No. 10 & No. 15 blades
. Periosteal elevators
. Mouth gag.
. Piezosurgery system with OT-7 insert
. Physio-dispensor set with handpiece.
. Self retaining retractor.
. Langenback retractor.
. Electrocautery set.
. Chisel and Osteotome.
. Mallet
. Normal Saline.
. Povidine Iodine Solution.
. Sterile bowls.

Procedure-

The tibial tuberosity or Gerdy's tubercle were identified as landmarks for the donor area and marked for location of a site just medial to the tuberosity on the tubercle for access to graft harvest. Lignocaine 2% was used for local infiltration anesthesia and then using a no.10 scalpel , a 2 inch vertical incision was placed over the region marked previously. Subcutaneous dissection was carried down to the periosteum after dissecting past the fatty tissue using a cautery and the shaft of tibia was identified at its upper 1/3rd. Having secure self – retaining retractor in situ, a bony trapdoor- like window was made to access the cancellous portion inside and the entire cortico-cancellous block harvested. Gentle irrigation was carried out using normal saline and betadine wash was given before closing the wound in layers(vicryl 3-0 for deep layers and ethilon 3-0 for skin). A mild compressive dressing was placed over the wound for next 7-10 days. NSAIDS (Diclofenac Sodium) 50 mg in combination with Paracetamol 500mg was given.

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III. RESULT

Patient distribution according to age.

Parameters	n	Mean +_ SD
Age	15	26+_ 7.32

Patient distribution according to gender

Parameters	Attributes	N
Gender	Male	8 (53.3%)
	Female	7 (46%)

Area of operation-

Parameters	Attributes	N(%)
Area of operation	Maxilla	9 (60%)
	Mandible	6 (40%)

Parameters of the Study-

Parameters	n	Mean+_ SD
Duration of Surgery (in min.)	15	36+_2.6
Duration of post-operative pain(in days)	15	6.80 +_ 4.94
Initial healing time(in days)	15	10.87+_ 2.58
Duration of edema in lower limb(in days)	15	5.2+_ 3.9

Association between Duration of post-operative pain and initial healing time using student t test.

Parameters	Mean+_ SD	P value
Post-Operative Pain	6.80 +_ 4.94	
Initial healing time	10.87+_ 2.58	0.009*

Association between duration of post operative pain and lower limb edema using student t test.

Parameters	Mean+_ SD	
Post-operative pain	6.80+_4.94	P value- 0.34
Duration of edema in lower limb	5.2+_ 3.9	

IV. DISCUSSION

This study consisted of 15 patients out of which 8 were male (53.3%) and 7 female (46.7%) who reported to the Dept. of Oral and Maxillofacial Surgery in M.R.Ambedkar Dental College & Hospital, Bangalore. All our patients were prescribed antibiotics pre-operatively and post-operatively for 5 days. Post operative analgesics were also prescribed for all patients. 14/15 patients did not complain of pain at the donor site after 7th day. (Mean= 6.80 days, SD= 4.94 days). 1/15 patient had post-operative pain till 25 days. The patient had infection of the donor site which was treated by removing the sutures on the 5th post operative day and draining the abscess and higher antibiotics.(Inf. Linezolid 500 mg BD for 5 days). Initial healing was achieved in 14/15 patients (93.33%) between 10-15 days (mean= 10.87 days, SD= 2.58), when sutures were removed from the donor site. In 1/15 patients (6.66%) sutures had to removed on 5th post operative day as he had developed an infection at the donor site which needed to be drained. The wound was left open till infection was controlled and left to heal by secondary intention with regular change of dressings.

Post operative edema at the donor site was minimal and was present for 3-4 days after surgery in 14/15 patients (93.3%) and was confined around the surgical site in the upper 1/3rd of the tibial bone. 1/15 patient(6.66%) had post operative wound infection which led to the swelling of the leg from the upper 1/3rd of tibia till the ankle. The edema of the leg lasted for about 15 days and subside thereafter as the infection was put under control. A statistically significant association (p=0.009) was obtained by using student t test between initial healing time and duration of post operative pain at the proximal tibial donor site. The mean initial healing time was 10.87 days (SD=2.58 days) and duration of post operative pain was 6.80 days (SD=4.94 days) when Piezosurgery was used for harvesting block bone graft from the proximal tibia. Another association was found between post operative pain and lower limb edema when Piezosurgery was used to harvest block bone from proximal tibial bone using student t test. The mean post operative edema was seen for 5.2 days (SD=3.9 days) and post operative pain was present for 6.80 days (SD=4.94 days). Although this association was not statistical significant. (P=0.34)

V. CONCLUSION

Our study serves to summarize that Piezosurgery is an excellent tool to harvest bone grafts from the tibia with minimal complications and co-morbidity. The technique is extremely useful to harvest bone as the host site does not express any long term healing issues in terms of edema, pain or even function (gait disturbances) and the recipient site has the advantage of getting bone with increased number of viable cells.

BIBLIOGRAPHY-

[1]. Newkam FW. Bone transplantation in combination with implants. Nieder sachsisches Zahnarzteblatt 1990; 25: 446-450.

[2]. Savant TD, Smith KS, Sullivan SM, Owen WL. Bone volume collected from dental implant sites during osteotomy. J Oral Maxillofac Surg 2001; 59: 905-907.

[3]. Donos N, Kostopoulos L, Karring T. Alveolar ridge augmentation by combining mandibular bone grafts and non resorbables membranes. Clinical oral implants Reserch 2002: 13: 185-191.

[4]. Hallman M, Sennerby L. A clinical and histologic evaluation of implant integration in the posterior maxilla after sinus floor augmentation with autogenous bone, bovine hydroxyapatite, or 20:80 mixture. Int J Maxillofac Implant 2002: 17 : 635-643.

[5]. Simion M, Jovanovic SA, Piatelli A. Vertical ridge augmentation around dental implants using a membrane technique and autogenous bone or allografts in humans. Int J Periodontics Restorative Dent 1998:18:8-23.

[6]. Misch CM . Comparison of intraoral donor sites for onlay grafting prior to implant placement.Int J Oral Maxillofac Implants 1997: 12: 767-776.

[7]. Horton JE, Tarpley TM, Wood LD. The healing of surgical defects in alveolar bone produced with ultrasonic instrumentation, chisel and rotary bur. Oral Surg Oral Med Oral Pathol 1975 Apr:39(4):536-46.

[8]. Vercelloti T. Technological characterstics and clinical indications of piezoelectric bone surgery.Minerva Stomatol 2004;53(5):207-214.

[9]. Mectron Medical Technology I: Piezoelectric Bone Surgery Handbook 2002.

[10]. Maintz G. Animal experiments in the study of the effect of ultrasonic waves on bone regeneration. Strahlentherapie 1950: 82: 631-8.

[11]. Horton JE, Tarpley TM jr. Clinical application of ultrasonic instrumentation in the surgical removal of bone. Oral Surg Oral Med Oral Pathol 1981 Mar; 51(3):236-42.

[12]. Eggers G, Klein J, Blank J, Hassfeld S. Peizosurgery : an ultrasound device for cutting bone and its use and limitations in maxillofacial surgery. Br.J Oral Maxillofac Surg.2004: 42:451—3.

[13]. O Keefe RM, Reimer BL, Butterfield SL. Harvesting of autogenous cancellous bone graft from the proximal tibial metaphysic. A review of 230 cases.J Orthop Trauma 1991;5:469.

[14]. Alan S. Herford, Brett J King, Franco Audia. Medial approach for tibial bone graft.Anatomic study and clinical technique. J Oral Maxillofac Surg 2003;61:358-363.

[15]. Yuan –Chien Chen, Chung ho Chen . Donor site morbidity after harvesting of proximal tibial bone . Wiley InterScience 2006 May 496-500.