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The use of iliac crest block onlay grafts and dental implants for the oral rehabilitation of severe trauma patients

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RESTORATIVE CHALLENGES OF SEVERE TRAUMA

Severe trauma can result in:
Significant loss of teeth and associated soft and hard tissues (Fig 1 and 2)
Retained teeth that have been fractured, luxated or avulsed and re-implanted, compromising their long term prognosis (Fig 3)
Bony fractures requiring fixation with intra-osseous screws, wires and bone plates which can complicate bone grafting and implant placement (Fig 4 and 5)

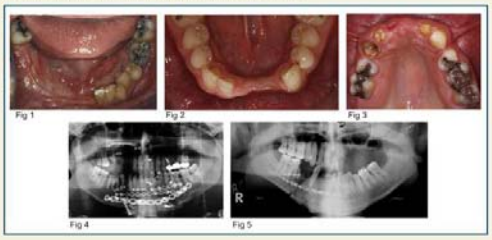
Fig 1 Fig 2 Fig 3 Fig 4 Fig 5

Providing these patients with a fixed restoration can be extremely challenging
The simplest solution is often to provide a removable partial denture which can replace not only the teeth but also the missing hard and soft tissues in the form of a pink acrylic flange
However, many patients are reluctant to accept a removable prosthesis and often seek a fixed solution to their problem
Often large edentulous spans rule out any form of bridgework for these patients leaving dental implants as the only predictable fixed replacement option
In order to place dental implants bone grafting is often necessary. This poster describes the use of iliac crest block onlay grafts in the rehabilitation of trauma patients

ASSESSING FOR BONE LOSS & GRAFTING

Fig 6 shows a patient who had a cricket ball injury resulting in the loss of his upper anterior teeth
Following planning (Fig 7) the extent of buccal bone loss became apparent. In order to place implants which would allow the final restoration/teeth to be placed in the ideal position, a block onlay bone graft was necessary
Fig 8 highlights the extent of buccal bone loss once a flap had been raised for an iliac crest block onlay graft
Placing implants in this patient without block onlay bone grafting may have been possible however this would have resulted in a compromised aesthetic outcome with loss of lip support from the anterior teeth due to the inappropriate position of the final restorations
This highlights the importance of prosthetically driven implant placement

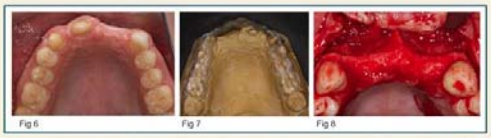
Fig 6 Fig 7 Fig 8

CHOICE OF DONOR SITE FOR BONE GRAFT

Bone for grafting a single tooth site can often be harvested from intra oral sites such as chin or ramus
When multiple teeth are missing and the whole site needs augmentation, intraoral sites may not be able to provide sufficient amount of bone and therefore extra oral sites need to be considered
Extra oral sites for harvesting bone can include:

- Iliac crest
- Fibula
- Calvarium

Advantages of Iliac crest	Disadvantages of Iliac crest
Osteogenic potential	Cortico-cancellous endochondral bone therefore revascularises slowly and resorbs more rapidly compared to intraoral intramembranous block grafts with more cortical bone.
Relatively easy to harvest	Donor site morbidity
Harvest large bone volume to correct large defects and restore ridge form	Difficulty in managing soft tissues for primary closure
Simultaneous surgery at recipient site and donor site	Longer treatment time

HARVESTING BONE FROM ILIAC CREST & GRAFTING

Recipient site is exposed (Fig 8) and size of defect measured in three planes (Height, width and thickness)
The iliac crest is then exposed and the bone marked to represent the dimensions of bone required (Fig 9)
Bone is sectioned using a surgical saw and removed (Fig 10 – 11)
The block often requires trimming down to a shape that fits the defect
Recipient bed is perforated prior to the block graft being secured in place with bone screws (Fig 12)

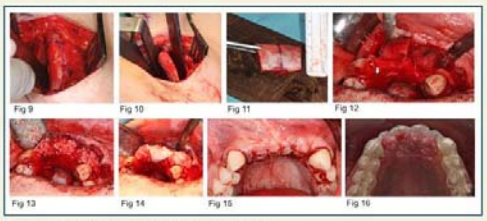
Fig 9 Fig 10 Fig 11 Fig 12 Fig 13 Fig 14 Fig 15 Fig 16

Success rate of block grafts can be improved by ensuring:

- Close adaptation of graft to recipient site
- Immobility of the graft
- Packing of particulate bone in the gaps around the block graft with a mixture particulate xenograft and cancellous bone material (Fig 13) to speed up revascularisation
- Use of a membrane to slow down resorption of graft (Fig 14)
- Achieving good primary closure
- Good oral hygiene, avoiding smoking and good post op care

Achieving primary closure after an extensive bone graft can be a significant challenge as often the soft tissue is lacking (Fig 15)
Fig 16 shows the grafted site at two weeks. Notice the difference in bone position in relation to the stent compared to Fig 7

IMPLANT PLACEMENT INTO GRAFTED BONE

Block grafts need to be left in place for a period of time to allow bony union with the recipient site to occur However, the longer the graft is left the greater the chances of bone resorption
The ideal time for implant placement is therefore around 4 months
Fig 17 shows implants placed into the grafted site following removal of the bone screws
The increased bone volume allows implants to be placed in the ideal position in relation to the stent for a screw retained prosthesis (Fig 18)
Implants into grafted bone show reduced success rates. To help minimise failure and complications, it is advisable to leave the implants submerged for a period of 4-6 months for osseointegration to occur
Fig 19 shows the soft tissue healing of the peri-implant tissues following exposure. The implants are now in the ideal position and ready to receive a provisional restoration to allow further soft tissue remodelling
Fig 20 shows the provisional screw retained restoration in place. Note the ideal tooth position of teeth


Fig 17 Fig 18 Fig 19 Fig 20

COMPLEX TRAUMA CASE

Fig 21-23 shows a case of advanced trauma in a patient who sustained multiple facial lacerations and fractures following an accident with a large industrial cutting machine
Initial management involved open reduction and internal fixation to manage the fractures to the mandible and maxilla (Fig 4) followed by extraction of several teeth
Following healing the patient presented to the restorative department for replacement of his teeth
Clinical examination highlighted several teeth that were missing in both the upper and lower arch and a poor prognosis of the LL123, which were subsequently extracted.
Due to the extensive soft and hard tissue loss (Fig 21-23) the treatment options were limited. Initially the patient was provided with removable partial dentures replacing lost teeth, bone and soft tissue however, the patient was keen on having a fixed option.
The upper arch was restored with a combination of implant retained and conventional crowns and bridges, with some localised guided bone regeneration at UL4
The lower arch was more complicated and required an iliac crest block onlay graft to increase bone volume (Fig 24 & 30) followed by implant placement under local anaesthetic into ideal positions for a screw retained prosthesis (Fig 25-26)
A free gingival graft was carried out in the LR4 (grafted) region to increase the amount of peri-implant keratinised tissue (Fig 26)
The final restorations involved two implant retained crowns and a large 8-unit screw retained bridge off 4 implants (Fig 27-29 & 31). To compensate for the loss in soft and hard tissue, pink porcelain was added to the bridge

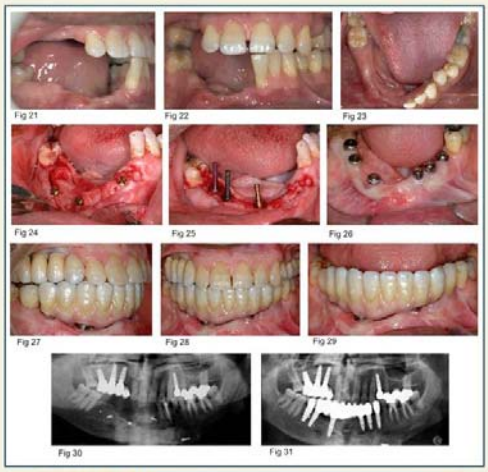
Fig 21 Fig 22 Fig 23 Fig 24 Fig 25 Fig 26 Fig 27 Fig 28 Fig 29 Fig 30 Fig 31

DISCUSSION

Rehabilitation of patients who have had extensive trauma can be challenging
Careful planning is required to assess the bone volume available, the position of the available bone in relation to the proposed final restorations and the amount of keratinised soft tissue present
Often in many patients the bone is lacking and grafting of the site is required
Iliac crest is often a good donor site for the reasons outlined in this poster
The clinical technique outlined in this poster for the grafting procedure can result in a predictable outcome
Timely implant placement into the grafted bone is essential along with possible soft tissue grafting to ensure healthy peri-implant tissues can be maintained
Successful management of these complex cases often requires a multi disciplinary team approach to ensure optimal outcome

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The Leeds Teaching Hospitals NHS
NHS Trust