OSSEOINTEGRATION

Definition
OSSEOINTEGRATION

A direct structural and functional connection between ordered living bone and the surface of a load carrying implant

P-I Branemark
OSSEOINTEGRATION

Relies on an understanding of:

- Tissue healing and repair
- Tissue remodelling
- Soft tissues
- Hard tissues
- Effects of forces in all vectors
- Immune response to the insertion of foreign bodies
HISTORY

Century

17  Dental transplantation
    Subperiosteal
    Transosteal
    Vitreous carbon
    Blade
    Osseointegrated

20
<table>
<thead>
<tr>
<th>Year Range</th>
<th>Research Focus</th>
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</thead>
<tbody>
<tr>
<td>1952-1960</td>
<td>Vital microscopy</td>
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<tr>
<td>1960-1968</td>
<td>Repair and regeneration of bone and marrow</td>
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<tr>
<td>1965</td>
<td>First jaw implant</td>
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<tr>
<td>1965-</td>
<td>Clinical research</td>
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</tbody>
</table>
SUCCESS

- Rates
- Criteria
- Research reports
The dental implant must provide functional service for 5 years in 75% of cases
SUBJECTIVE CRITERIA

- Adequate function
- Absence of discomfort
- Improved aesthetics
- Improved emotional and psychological wellbeing
OBJECTIVE CRITERIA

- Bone loss no greater than 33% of vertical length of implant
- Good occlusal balance and vertical dimension
- Gingival inflammation amenable to treatment
- Mobility of less than 1mm. in any direction
- Absence of symptoms of infection
- Absence of damage to surrounding structure
- Healthy connective tissues
## SUCCESS RATES

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Success Rate</th>
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<tbody>
<tr>
<td>Subperiosteal</td>
<td>39 - 90</td>
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<tr>
<td>Staple</td>
<td>95</td>
</tr>
<tr>
<td>Vitreous carbon</td>
<td>50</td>
</tr>
<tr>
<td>Blade</td>
<td>65 - 90</td>
</tr>
<tr>
<td>Osseointegrated</td>
<td>80 - 100</td>
</tr>
</tbody>
</table>
BRANEMARK SYSTEM

- Development
- Integrated Design
- Quality Control
- Precision
- Reliability
ALTERNATIVE TECHNOLOGY

- IMZ
- ITI
- 3M
- Corevent
- Apatite coated
INDICATIONS FOR TREATMENT

Factors precluding wear of a removable prosthesis

- Poor anatomy for denture support
- Poor oral muscular coordination
- Poor mucosal tissue tolerance
- Parafunctional habits
- Unrealistic expectations
- Hyperactive gag reflex
- Psychological inability to wear
- Unfavourable number and location of abutments
- Single tooth loss
INDICATIONS

- Fully edentulous
- Partially edentulous
- Single tooth
INDICATIONS -

FULLY EDENTULOUS

- Poor retention
- Functional disturbances
- Psychological disturbances
MEDICAL EVALUATION

- Cardiovascular
- Respiratory
- Renal
- Musculoskeletal
- Neurological
- Endocrine
SPECIFIC MEDICAL CONDITIONS

- Diabetes
- Coronary artery disease
- Alcoholism
- Drug therapy
  - anticoagulants
  - anti epileptics
  - antidepressants
  - others
- Osteoporosis
- Smoking
PSYCHE

- Perception of outcome
  - hypercritical
  - demanding
  - unrealistic expectation
- Time and expense
- Aesthetics
- Maintenance
Assessment of overall oral health
Prior to implant therapy, completion of:-
  ● Oral Surgery
  ● Periodontal therapy
  ● Endodontics
Temporisation of restorative dentistry
Oral hygiene controlled and maintained
RADIOLOGY

- OPG
- Lateral Cephalogram
- Periapicals
- CT Scan - axial
- coronal
- 3D reconstruction
- Dentascan
- MR
**DIAGNOSIS**

- **Bone Quantity**
- **Bone Quality**
- **Associated structures**
  - inferior alveolar nerve
  - mental nerve
  - maxillary antrum
  - nasal floor
  - incisive canal
- **Pathology**
  - retained dental remnants
  - periapical pathology
  - cysts
  - other pathology
ALVEOLAR FORM

A  Good alveolar ridge form
B  Moderate residual ridge form
C  Advanced resorption / Basal bone only
D  Basal bone resorption
E  Extreme resorption
BONE QUALITY

1. Mainly cortical plate compact bone
2. Thick compact bone with a dense trabecular core
3. Thin cortical plate with dense trabecular core
4. Thin cortical plate with low density trabecular core
BONE QUALITY

Upper jaws

Shape: A  B  C  D  E

Lower jaws

Quality: 1  2  3  4
ANATOMY

- Mental nerve
- Inferior alveolar nerve
- Nasal cavity
- Maxillary antrum
- Incisive canal
- Soft tissues
SURGICAL REQUIREMENTS

- Standardised surgical protocol
- Surgical environment
- Implant equipment - reusable
  - disposable/single use
- Fully evaluated and prepared patient
- Trained staff
EQUIPMENT

FIRST STAGE
STAINLESS STEEL

- Guide drill
- 2mm twist drill
- Pilot drill
- 3mm twist drill
- Countersink
TITANIUM

- Tap
- Implant
- Coverscrew
ANAESTHESIA

- General
- Local
- Sedation
SURGICAL

- Aseptic technique
- Gentleness
- Precision
SURGICAL PRELIMINARIES

- Induction of anaesthesia
- Endotracheal intubation
- Throat pack
- Scrub and gown
- Surgical preparation
- Draping
SURGICAL PROCEDURE

- Local Anaesthetic
- Try in stent
- Tattoo
- Surgical incision
- Flap reflection
- Flap retraction
- Try in stent
SURGICAL PROCEDURE

- Smooth ridge
- Use stent
- Guide drill
- Small twist drill
- Pilot drill
- Large twist drill
- Depth guide
SURGICAL PROCEDURE

- Countersink
- Fixture insertion
- Cover screw
- Debridement
- Closure
POSTOPERATIVE CARE

- Haemostasis
- Analgesia
- Antibiotic regime
- Chlorhexidine mouthwash
- Suture removal
- Temporary prosthesis
SECOND STAGE

- Soft tissue
- Bone removal
- Cover screw removal
- Healing abutment
- Replacement
- Dressings
KEY POINTS

- Implant positioning
  - bucco/lingual
  - axial
  - separation

- Drill speeds
  - 2000rpm
  - 20rpm

- Torque

- Irrigation
MAXILLARY IMPLANTS

- Lack of well defined cortex
- Poorer quality cancellous bone
- Lack of bucco/lingual width
- Reduced height of available bone
- Proximity of anatomical structures - nose
  - antrum
  - incisive canal
TECHNIQUE MODIFICATIONS

- Countersinking
- Self tapping implants
- Wide implants
COMPLICATIONS WITH OSSEOINTEGRATED IMPLANTS
COMPLICATIONS

- Preoperative
- Perioperative
- Postoperative
- Transient
- Persistent
- Permanent
- Soft tissue
- Hard tissue
SERIOUS COMPLICATIONS

- Jaw fracture
- Haemorrhage
- Ingestion
- Inhalation
- Neurological
- Death
COMPLICATIONS

- Patient selection
  - Psyche
  - Anatomy
  - Systemic disease
- Implant factors
- Surgical
- Prosthodontic
- Errors in judgement
- Deviation from established protocol
ANATOMY

- Unsuitable morphologically
- Reduced bone density
- Reduced bone volume
- Attached tissue
- Nerve position
PREVENTION OF NERVE DAMAGE

- CT
- Bone density measurement
- Drill sleeves
- Discretion is better part of valour
COMPLICATIONS

Peroperative

- Failure to obtain anaesthesia
- Haemorrhage
- Stuck implant
- Loose implant
- Lost implant
SURGICAL FAILURE

- Poor planning
- Poor surgical technique
- Lack of precision
- Thermal injury
- Faulty placement
- Damage to adjacent structures
SURGICAL

- Haemorrhage
- Stuck implant
- Loose implant
- Lost implant
COMPLICATIONS

- Wound dehiscence
- Infection
- Mucosal perforation
- Fistula formation
- Anatomical - antral
  - nasal
  - neurological
STAGE ONE SURGERY

- Failure to obtain anaesthesia
- Faulty placement
- Anatomical
- Surgical
SURGICAL

- Stripped bone threads
- Exposed implant threads
- Fractured drill
- Sheared implant hex
- Excessive countersink
- Eccentric drill
COMPLICATIONS

Second stage

- Loose implant
- Excess bone coverage
- Exposed threads
- Coverscrew problems
STAGE TWO SURGERY

- Wrong abutment length
- Faulty abutment seating
- Retained sutures
- Gingival hyperplasia
- Mobile tissue
- Destroyed cover screw hex
- Failure of integration
Labial / buccal
Lingual
Too close
Straight line in mandibular anteriors
Angulation
Divergence
Correct by use of a surgical template
POSTOPERATIVE

- Fascial space infections
- Haematoma
- Jaw fracture
- Sinusitis
- Wound dehiscence
WOUND DEHISCENCE

- Poor flap design
- Poor surgical technique
- Poor repair
- Poor tissue quality
- Previous surgery
- Underlying medical condition
- Superficial implant placement
PERSISTENT

- Neurological damage
- Aesthetics
- Speech
- Function
- Psychological
COMPLICATIONS

Long term

- Anatomical
- Neurological
- Deintegration
- Progressive thread exposure
- Gingivitis
- Hyperplastic tissue
- Fractured Implant
PROSTHODONTIC

- Avoid premature loading
- Passive fit
- Good design
- Good oral hygiene
- Loss of integration
- Soft tissue problems
- Oral hygiene and maintenance
- Retrievable v cemented
COMPONENT FAILURE

- Fractured fixture
- Fractured abutment screw
- Fractured punch blade
- Fractured screw driver tip
- Fractured castings
MANAGEMENT OF FAILURE

- Failing implants FAIL
- Removal
- Abandon
- Alternative site
- Larger diameter
- Replacement after healing
GRAFTING TECHNIQUES
## Grafting

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| Autogenous | - **Local**  
  - symphysis  
  - third molar  
  - angle  
  - tuberosity  
  - **Distant**  
  - rib  
  - iliac crest  
  - tibia  
  - calvarial |
| Allogenic  | - frozen  
  - freeze dried  
  - demineralized |
BIOMATERIALS

- methyl methacrylate
- silicone
- proplast
- teflon
- calcium phosphates
  - plaster of paris
  - tricalcium phosphate
  - hydroxyapatite
  - goretex
GRAFTS

- Autogenous bone
- Freeze dried bone
- Synthetic biomaterials
FREEZE DRIED BONE

- Commercial preparation
- Multiple donors
- Screened for HIV, Hep B and C
- Sterilised by irradiation
- Risk of prion borne disease
- Not licensed in Australia
CALCIUM PHOSPHATES

- Plaster of paris
- Tricalcium phosphate
- Hydroxyapatite
INDICATIONS FOR GRAFTING

- Anterior maxilla
- Posterior maxilla
- Anterior mandible
- Posterior mandible
- After resection
- Post traumatic
TECHNIQUES

- Cortico-cancellous blocks
- Trephined core
- Sinus Lift
- Vascularised bone flap