Things I have Learned from Patient Care

- Despite all efforts, you cannot legislate to make people care.
- You cannot make people value health or education.
- Refined skill, judgement and care is the best offering for your patients.
- Empathy, genuine concern, and commonality are the best basis of communication.
- Never ask anything of your auxiliaries that you are not willing to do yourself.

But, what do you actually do at the Mayo Clinic?

- Patient care 85%
- Education 10%
- Research 5%

Current Trends in Implant

- Routine Use of Dental implants
- 15-20% Growth Globally
- Single Tooth Replacement #1 Indication
- More than 50% of Implants Placed with Bone Grafting
- Reduced Healing and Treatment Periods
- CAD CAM Technology Can Be Used in Certain Areas of Implant Dentistry
### Diagnosis

- **SAC Classification**
  - Straightforward: Simple procedures; low risk for surgical, prosthetic or esthetic complications
  - Advanced: Some risks associated with procedure and may require some advanced planning to intercept potential problems.
  - Complex: Case which may require interdisciplinary planning, staged treatment phases and modification of patient behaviors.

- **ITI Assessment tool**
  - [http://www.it.org/?a=1881&n=3001&n=1881&n=2581&n=2581&n=2581&n=2581&n=2581&n=2581&n=2581&n=2581](http://www.it.org/?a=1881&n=3001&n=1881&n=2581&n=2581&n=2581&n=2581&n=2581&n=2581&n=2581)

### Five Core Questions for Diagnosis

- What are the facial proportions and skeletal relationships?
- What are the length and mobility of the upper lip?
- What is the relationship between the gingival line and the horizon?
- What is the length of the maxillary central incisor?
- Is the CEJ palpable in the gingival sulcus?

*Global Diagnosis, Robbins and Rouse, Quintessence 2016*

### Esthetic Outcomes

*Belser et al. 2009 J Perio*

### Work Flow Choices

- **Analog**
- **Analog/Digital**
- **Digital**
Analog/Digital

Diagnostic Wax up

Digital Treatment Planning

- Is it worth it?
- How much does it cost?
- What can you do with it?

- 3 Shape (Implant Studio)
- Dental Wings (DWOS with coDiagnostiX)
- Exocad (Open Software)
- X-Nav (Live Time Navigation)

Digital Smile Design
www.digitalsmiledesign.com
D2000 Scanner

Scan Diagnostic Casts

Export to STL files

Workflow in Planning Software

Create Surgical Guides/Temps

3 Shape Planning Software

Virtual design for Provisional

Real time design of Surgical Guide

Dental Wings Planning Software

Dental Wings Planning Software
Surgical Stents

- What Information is Needed? CBCT and Digital Impression data.
- Needed/Worth It? Singles in anterior/complex cases
- Economical Method (Analog/Digital)

What’s the Cost?

- Stent and CBCT makes 16% of the fee.

Lab Fees: Treatment Planning and Surgical Stents

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Cost: $30,000 + $99 per arch
Digital Impressions

- Chairsde digital acquisition of data to digital file.
- Tooth Preparation
- Implant Position Transfer
- Edentulous Arch

Digital Impression Capture

Bella Tech Encode Healing Abutment

Kimiyo Watanabe Sawyer, CDT

Trios 3Shape

Fast: 1 arch in about 15 seconds
Accurate: One of the highest precision
Cost: $30-45K

Digital Implant Impressions

- Digital Impression post (Intraoral Scan Body)
- High Variability in scanning information
- Limited Data Available to guide choosing for a given clinical situation
- Interaction between Scanner and ISB is not well understood

Intraoral scan bodies in implant dentistry: A systematic review; Mauroski et al; (J Prosthet Dent 2018) In Press
Digital Impression Practical?

- **Positives:**
  - High fidelity of data
  - Models not needed for single implants
  - (Accurate, but a check only for proximal contacts and occlusion)

- **Negatives:**
  - Accuracy of multiple implants casts inconsistent
  - Abutment emergence profile/finish line limited with printed models
  - Restrictive with participating labs

---

**Implant Selection**

- **Nobel Biocare:**
  - Branemark, Replace, CC Parallel/ NobelActive.

---

**Component Connection**

- Binon et al 1996 pointed out connection of external hex is variable in accuracy by as much as 6 degrees.

---

**Comparison of Implant Connections**

- Compared 27 studies of 586 Ext Hex
- 1,113 Int Conn
- Abutment screw loosening is a rare event in single-implant restorations regardless of the geometry of implant-abutment connection, provided that proper antirotational features and torque are employed.


---

**Comparison of Implant Connections and Bone Loss**

- Compared 10 studies of 1,718 Ext Hex
- 1,475 Int Conn
- Bone loss was not significantly different. (2 studies comparing Astra and Branemark of up to 15 years did not show significant bone loss differences) More studies needed to validate.


---
Implant Selection (Does this matter?)

- Internal/External/tapered Connection
- Platform Switching (Real or Perception?)
- Ease of Prosthetic Delivery (Operator Preference: simplicity, wide selection)

Implant Selection

- **Nobel Biocare**: NobelActive, CC Parallel and Replace, Branemark
- **Straumann**: Bone Level, Tissue Level
- **Zimmer-Biomet**: Certain Prevail, Tapered Screw Vent, T3, Osseotite
- **Biohorizons**: Tapered Plus, Tapered Tissue level

How is the Ease of Delivery?

- Firm grasp of components
- Easy/simple versatile design for drivers
- Retrieval of abutments
- Easy to Understand Flow Diagrams

Consideration for Placement in Esthetic Zone

- **Class I**: 81%
- **Class II**: 7%
- **Class III**: 1%
- **Class IV**: 11%

Angled Screw Channel

25 degree correction
**ASC Limitations**

- Can only be used with Certain Implant from Nobel Biocare (Active, Parallel CC, and Replace CC) and Bone Level Straumann
- Can only be used with CAD CAM designed abutments crowns and bridges.
- Need specific driver with abutment screw (Omni-Grip)

**How About a Full Arch?**

- How many implants? (affordability)
- How much bone available? (distribution)
- How much restorative space? (height)
- What is the opposing? (occlusal pairing)

**Number of Implants**

- Edentulous Maxilla traditionally treated with 6-7 implants for full arch replacement.
- Evidence indicate as few as 4 (10mm) implants for a shortened dental arch. (Where posterior bone limits placement)
All on Four Concept

- Unpublished data from Malo (10 year):
  - 648 Edentulous Maxilla: 93.98% (39 failures)
  - 1364 Edentulous Mandible: 99.41% (8 failures)

Academy of Osseointegration Presentation 2014

Zygomatic Implants

- There is flexure of these implants when loaded
- Use where there is sufficient inter arch distance
- Where insufficient prosthesis thickness is evident, choose resin to metal restoration.

Limitations of Zygoma Implants

- In either approach, prosthesis survival often related to implant distribution
- Maintenance, Repair and Multiple replacement within patient's lifetime
Implant Selection

- **Straumann:** Bone Level, Tissue Level

Cemented or Screw Retained?

- Cement Retained Prosthetics easier to fit
- Often work at the abutment level (easier)
- Retrieval difficult/unpredictable
- Difficult to control cement

Screw Retained or Cemented?

- Screw Retained Prosthetics difficult to fit
- Connection at the Implant level (difficult)
- Retrieval easier/predictable
- Cement not an issue
- Biomechanics more stable
- Forming tissue profiles easier
- Conceals components

Angle Correction Abutments
Screw DTF
Abutment Level
Rest Support
Screw DTF

Screw Retained or Cemented? How about Both?

Treatment Planning
Edentulous Mandible

Ceramometal Fixed Prosthesis
Implant Retained Overdenture
Fixed Complete Denture
Implant Supported Overdenture

Rules of Cantilevering

• Ovoid Arch

For 4 Implant Model, the CL/AP Ratio should be 1.6:1
For 5 Implant Model, the CL/AP Ratio should be 1.7:1
For 6 Implant Model, the CL/AP Ratio should be 1.8:1

Mayo Clinic, Eastman, University of Toronto, University of Washington, UTSAHSC, NYU have been active in the clinical application of dental implants for 35 years.
Interarch Spatial Requirements

- Locator: 8-9 mm
- Milled Bar: 10-11 mm
- Fixed Complete Denture: 11-12 mm
- Metal Ceramic Fixed Dental Prosthesis: 7 mm

Interarch Distance Requirement

- Resin to Metal:
  - >3 mm Resin*
  - >3 mm Resin Tooth**
  - >4 mm Bar Height***
  - 2 mm Hygiene Clearance

Acrylic Resin/Metal Prosthesis Design

- Wrap Around
- Metal based

12-15 mm minimum requirement

Worn Teeth
Follow up Study on Servicing of Resin-Metal Prostheses

Average time of follow-up 13 years

- At least one prosthetic Event was experience by 58% of patients

<table>
<thead>
<tr>
<th>Event</th>
<th>N(%)</th>
<th>Years from Implant Placement</th>
<th>Visits Needed</th>
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<tbody>
<tr>
<td>Fractured Screw</td>
<td>113(18)</td>
<td>7.4</td>
<td>1.4</td>
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<tr>
<td>Fractured Abutment</td>
<td>73(11)</td>
<td>6.4</td>
<td>1.3</td>
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<tr>
<td>Wear</td>
<td>63(8)</td>
<td>13.9</td>
<td>4.6</td>
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<tr>
<td>Hyperplasia</td>
<td>97(57)</td>
<td>3.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Mobile Implant</td>
<td>23(14)</td>
<td>3.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Infection</td>
<td>15(9)</td>
<td>6.3</td>
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</tbody>
</table>

Porcelain chipping/fracture was the most frequent technical complication, 31.25% chipping rate.
• Screw Retained Cross arch splinted design

**Workflow Pathway**

– Choose one where communication can transfer easily
– Single versus multiple implants

**Implant Selection**

– Choose system that allows ease in delivery
– Use internal connection in partial and well distributed arches.
– Flat top implants in complete or limited distributed arches
**Prosthesis Design**
- Screw Retained Preferable
- Use combination when not possible or preangulated abutments

**Material Selection**
- Use metal ceramic in arches with orthogonally placed implants
- Where flexure or potential movement exists, segment or use resin/metal based or component prosthetics.

Thank You
Salinas.thomas@mayo.edu