Paradigm Shift – Tilted Implants for Full Mouth Reconstruction

Where I started

Circa 1985

Branemark Implant Protocol 1985

Time schedule for the “gold standard” implant treatment protocol

Tooth Extraction

Fixture Placement

Uncover/Abutment Connection

Prosthetic restoration (functional loading)

12M

3M 6M 12M
Paradigm Shift – Tilted Implants for Full Mouth Reconstruction

**Paradigm Implant Protocol 1985**

- 12-month healing period after tooth extraction
- Healing period of 3 to 6 months
- Start of treatment to completion of the restoration extends for 1-2 yrs
- Leaves the patient with a missing tooth or teeth for an extended period of time


**Paradigm**

- *paradigm*
  - a pattern, example, or model
  - an overall concept accepted by most people in an intellectual community, as those in one of the natural sciences, because of its effectiveness in explaining a complex process, idea, or set of data

**Implant Paradigm Shifts**

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December 16, 2015
Paradigm Shift – Tilted Implants for Full Mouth Reconstruction

**Implant Paradigm Shifts**

**Fixed prostheses => Removable prostheses**

**Implants . . . .**

**Support dentures => Individual Teeth**

**Implants . . . .**

**Submerged => Non-submerged Protocols**

**Implants . . . .**

Fixed prostheses => Removable prostheses

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Implant Paradigm Shifts
Implants . . . . Type of Implant Designs

- Smooth
- Machined
- Textured
- Coated

Implant Paradigm Shifts
Implants . . . . Type of Surface Treatments

- Enhanced Surfaces:
  - Acid etched
  - Sand blasted
  - Titanium oxide blasted
  - HA coated
  - Anodized

External Connection => Internal Connection

Implant Paradigm Shifts
Implants . . . . “Platform switching”

4.1 mm
4.8 mm

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**Implant Paradigm Shifts**

**Implants . . . Osseointegration => Esthetics**

- Schnitman and Schulman, 1979
  1. Mobility less than 1 mm in any direction.
  2. Radiologically observed radiolucency graded but no success criterion defined.
  3. Bone loss no greater than one third of the vertical height of the bone.
  4. Gingival inflammation amenable to treatment, absence of symptoms and infection, absence of damage to adjacent teeth, absence of paraesthesia and anaesthesia or violation of the mandibular canal, maxillary sinus or floor of the nasal passage.
  5. Functional service for 5 years in 75% of patients

- Albrektsson et al. 1986
  1. Individual unattached implant that is immobile when tested clinically
  2. Radiography that does not demonstrate evidence of peri-implant radiolucency
  3. Bone loss that is less than 0.2 mm annually after the implant’s first year of service
  4. No persistent pain, discomfort or infection
  5. By these criteria, a success rate of 85% at the end of a 5 year observation period and 80% at the end of a 10 year period are minimum levels for success.

**Implant Paradigm Shifts**

**Implants . . . Osseointegration => Esthetics**

- Patients, 2015:
  1. Implant crown/prosthesis soft tissue contours appear to be better than original appearance.
  2. Implant crown/prosthesis looks more natural than original tooth.
  3. Esthetic harmony with adjacent teeth.
  4. Oh ya…. no bone loss, no mobility, no infection and lasts forever……..

**Implant Paradigm Shifts**

**Implants . . . Imaging Options => CBCT - Know the Bone**

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Implant Paradigm Shifts
Implants . . . Treatment Planning 2D => 3D

Implant Paradigm Shifts
Implants . . . Treatment Planning 2D => 3D

Implant Paradigm Shifts
Implants . . . Treatment Planning 2D => 3D

Implant Paradigm Shifts
Implant Placement . . . Delayed => Early => Immediate

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**Implant Paradigm Shifts**

Implant Loading . . . Delayed => Early => Immediate

**Implant Paradigm Shifts**

Implant Loading . . . Delayed => Early => Immediate

*Int Journal Oral and Maxillofacial Implants 2014; 29(suppl):256-270*

**Implant Paradigm 2008**

**Implant Paradigm 2008**

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Implant Paradigm 2008

Implant Paradigm

ClearChoice Implant Center

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December 16, 2015
ClearChoice Implant Center

All-on-4™ - Procedure

- Using tilted posterior RP implants
- Enabling few well spread implants
- 4 implants in the mandible or the maxilla
- Giving optimal prosthetic support

Tilted Implants for Full Mouth Reconstruction

Paradigm Shift!

Time for a Paradigm Shift?

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Tilted vs Axial Implants

Int. Journal of Oral and Maxillofacial Implants 2011, 26:976-984

Tilted vs Axial Implants

Int. Journal of Oral and Maxillofacial Implants 2011, 26:976-984

Tilted vs Axial Implants

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Tilted vs Axial Implants

Int. Journal of Oral and Maxillofacial Implants 2011, 26:976-984
**Paradigm Shift – Tilted Implants for Full Mouth Reconstruction**

**Tilted vs Axial Implants**

**Biomechanical Comparison of Axial and Tilted Implants for Mandibular Full-Arch Fixed Prostheses**

- **Conclusions:** Under the limitations of this photoelastic stress analysis, the posterior tilting of distal implants loaded in a full arch fixed prosthesis did not increase the stress in the disto-venal region around the distal implants under three loading conditions. This study utilized a virtual implant model to assess stress distribution and showed that the stress distribution in the distibular region of the hybrid implant depends on the position of the distal implant.

**Journal of Oral and Maxillofacial Implants** 2011, 26:976-984

**Tilted vs Axial Implants**

**Tilted Implants for the Rehabilitation of Edentulous Jaws: A Systematic Review**

- **Abstract:** The aim of this review is to evaluate the survival rate of implants and their associated costs and the literature available for these patients. A total of 362 patients had been treated with tilted implants in the mandible. The survival rate of implants was 98.8%. The costs of tilted implants were significantly lower than those of non-tilted implants.

**Clinical Implant Dentistry and Related Research** 2012, 14(4):612-621

**Tilted vs Axial Implants**

**Tilted versus axially placed dental implants: A meta-analysis**

- **Objectives:** The purpose of the present review was to test the null hypothesis of no difference in the implant failure rate, marginal bone loss, and postoperative infection for patients being rehabilitated by tilted or by axially placed dental implants, against the alternative hypothesis of a difference.


**Multnomah County Dental Society**

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**December 16, 2015**
FIXED IMPLANT BRIDGE (ALL-ON-FOUR)
Carlos M. Ugalde, DDS, MS

CONTENTS

• Introduction
• Sociodemographics
• History
• AO4 Concept
• Cases
• Modifications
• Take Home Information

IF WE GET THIS...

HOW CAN WE DELIVER THIS?
DO WE HAVE A BETTER SOLUTION?

• 41% of US population age 65+ is edentulous in at least one jaw

• 90% of the edentulous patients treated with removable dentures

STATISTICS ON EDENTULISM

NUTRITIONAL EFFECTS

• “The elderly edentulous avoid many types of foods, particularly raw vegetables and other hard and tough foods, because they cannot chew these with conventional dentures.”

• “As a result, such individuals consume significantly less protein and other key nutrients – including fiber, calcium, non-heme iron, and some vitamins – than do individuals with teeth.”

Hartsook, 1974; Wayler and Chauncey, 1983; Chauncey et al., 1984; Sheihan et al., 2001

• According to Center for Disease Control, people with missing teeth are more likely to have heart disease.

• People with 1-5 missing teeth are 7% more likely.

• People with 5-31 missing teeth are 10% more likely.

• People with all their teeth missing are 11% more likely.

STATISTICS ON EDENTULISM
IMPLANT OVERDENTURE

![Implant Overdenture Image]

CHEWING CAPACITY

<table>
<thead>
<tr>
<th>Type</th>
<th>Chewing Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Teeth</td>
<td>100%</td>
</tr>
<tr>
<td>Fixed Implant Bridge</td>
<td>90%</td>
</tr>
<tr>
<td>Implant OverDenture</td>
<td>60%</td>
</tr>
<tr>
<td>(Removable - tissue borne)</td>
<td></td>
</tr>
<tr>
<td>Upper Denture</td>
<td>30%</td>
</tr>
<tr>
<td>Lower Denture</td>
<td>10%</td>
</tr>
<tr>
<td>No Teeth, No Denture</td>
<td>0%</td>
</tr>
</tbody>
</table>

ORAL HEALTH IMPACT PROFILE (OHIP)

- Mandibular overdentures vs conventional denture: improved by 33%.
- Increased self-confidence
- Increased social activities
- Increased intimacy

WHAT IS THE STANDARD OF CARE?

![Teeth X-Ray Image]

2. Stig Wennberg, MB, Psychiatrist
WHAT IS THE STANDARD OF CARE?

ALL-ON-10

ALL WHAT THEY CAN AFFORD?

ALL-ON-8?
ALL-ON-6?

ALL-ON-FOUR?

MORE SOPHISTICATED …

WHY PATIENTS WANT DENTAL IMPLANTS?

- Eat what you want to eat
- Don’t want to wait
- Smile with confidence
- Look younger
- Improves overall health
WHY?

“No one should [have to] die with their teeth in a glass of water beside their bed.”

- Per-Ingvar Brånemark

HISTORY

GÖSTA LARSSON 1965-2005
SVEN JOHANSSON
IMPLANTS LONGER THAN ANYONE ELSE ON EARTH. 1967

48 YEARS...

TIMELINE

1965
First implant

1982
Toronto Conference

1990
Immediate Load

IMMEDIATE LOAD

Early Literature:
• Success rate: 80-98%
  • Schnitman et al., J Oral Impl, 1990
  • Henry, Rosenber, Pract Perio Aesthet Dent, 1995
  • Salama et al., Int J Perio Rest Dent, 1995
  • Schnitman et al., Int J Oral Maxillofacial Implants, 1997
  • Balshi, Wofinger, Implant Dent, 1997
  • Tarnow et al., Int J Oral Maxillofacial Implants, 1997
  • Piattelli et al., J Perio, 1997
  • Chiapasco M, et al., COIR, 1997
  • Balshi T, et al., Impl Dent, 1997
  • Lundgren, Talk of Times, 1998
  • Brunski, AO Meeting, 1999
  • Randow et al., ORal Imp Res, 1999

Contemporary Literature:
• Success rate: 94-98%
  Vertical Implants
  • Chiapsco M, IJOMI, 2001
  • Olsson M, et al., CID&RR, 2003
  • Jaffin RA, IJOMI, 2004
  • Boagaerde L, et al, CID&RR, 2004
  • Balshi T, et al, CID&RR, 2005
  • Ibanez JC, et al, JP, 2005
  • Ostman PO, CID&RR, 2005
### TIMELINE

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>First implant</td>
</tr>
<tr>
<td>1982</td>
<td>Toronto Conference</td>
</tr>
<tr>
<td>1990</td>
<td>Immediate Load</td>
</tr>
<tr>
<td>2001-2015</td>
<td>Angled Implant Concepts</td>
</tr>
</tbody>
</table>

### 4 IMPLANTS MANDIBLE

- Success rate: 97.5% or better
  - Malo P, CID&RR, sup 1, 2003
  - Bellini CM, et al, IJOMI, 2009

### ANGLED DISTAL IMPLANTS - MAXILLA

- Success rate: 95-98% or better
  - Matteson J, 1999 First Report, JOMS 2007 **98%**
  - Krekmanov L, et al, IJOMI, 2000 **97.2%**
  - Fortin, et al, CID&RR, 2002 **97%**
  - Rosen A, et al, JOMS, 2007 **97.8%**
  - Calandriello R, COIR, 2004-2005 **96%**
  - Balshi, T et al, CID&RR, 2005 **97%**
  - Capelli M, et al, IJOMI, 2007 **97.8%**

### TO THE NON-BELIEVERS

“It is what we think we know that stops us from knowing more!”

- Albert Einstein
This works...but what is better?

- **Principle**
  - Four implants
    - Two straight implants in the anterior and two angled implants in the posterior
  - Provisional, fixed, and **immediately loaded** full-arch prosthesis as a potentially graftless solution.
WHAT IS THE ALL-ON-4?

- **Indications**
  - Currently edentulous mandible or maxilla.
  - Simultaneous extraction of remaining teeth with implant placement and provisional restoration.

WHAT IS THE ALL-ON-4?

- **Maxilla 4 implants**
  - Malo P, et al, All-on-4 immediate-function concept with Brånemark System implants for completely edentulous maxillae: a 1-year retrospective clinical study, CID&RR 2005,
  - **32 patient**, 128 implants, 12 months 97.6% success

4 IMPLANTS - MAXILLA

- Malo P, et al, CID&RR 2005, 32 patients, 128 implants, 12 months **97.6%**
- Parel S, et al, JPD, 285 jaws, 1140 Implants up to 20 months loading **96.6%**
- Babbush C, et al, JOI 2011, 109 jaws, 436 implants up to 29 months **99.3%**
- Graves S, et al, OMS Clinic NA, 2011, 276 jaws, 1082 implants, 16 months **97.5%**
ALL ON FOUR CONCEPT

"Is not a product… Instead, it is all about immediate load…"

ALL ON FOUR CONCEPT

"Is not about 4 implants either… It is all about immediate load…"
Insertion of implants
Securing of Multi-unit Abutments
Securing of provisional prosthesis with prosthetic screws

TIME OUT!

- What's wrong with a sinus lift?

I RATHER HAVE A SINUS LIFT…

- Del Fabro, J Per Res. 252 articles, 2046 patients, 6913 implants 91.5%
- Wallace and Froum, An Per 2003, 92%
- Cho-lee, 177 procedures, 272 implants 93%

“I wrote an entire textbook about sinus lifts and I rarely do them now.”

–Ole Jensen
MY DEFINITION OF ALL-ON-FOUR

• A life changing, but simple, rapid and affordable approach to give your patients what they want.

WHY PATIENTS WANT DENTAL IMPLANTS?

• Eat what you want to eat
• Don’t want to wait
• Smile with confidence
• Look younger
• Improves overall health

WHY THE ALL-ON-FOUR WORKS?

BIOMECHANICS

“Design is a funny word. Some people think design means how it looks. But of course, if you dig deeper, it’s really how it works.”

–Steve Jobs
WHY THE ALL-ON-4 WORKS

- Structural and Mechanical Engineering

TRUSS EFFECT

- Triangles support higher loads of force, if they are splinted together
- Structural engineers design bridges with triangular struts (abutments)
  - Longer distance between abutments
  - Supports a higher payload of force
  - Building triangles disperses force over larger areas

WHY THE ALL-ON-4 WORKS

- Now we have taken their designs and applied them to dentistry

BIOMECHANICS

1983 Skalak Model
John Brunski
“Vertical and horizontal loads affected most by the Anterior Posterior Spread”

–John Brunski, PhD

6 IMPLANTS BETTER THAN 4. MAYBE YES?

6 IMPLANTS BETTER THAN 4. MAYBE NO?

IS TILTING DETRIMENTAL?
IS TILTING DETRIMENTAL? 
THE ANSWERS IS NO

- Force per implant will change if we change spacing $b$ to $b'$ where $b' > b$

BIOMECHANICS

- Tilting will increase strains in bone if the applied force is the same as when the implant is upright...
- ...but the tilting decreases the force on the implant relative to what it would have been if the implant had been upright.

UPRIGHT VS TILTED

- "Splinted implants receive 9x less load than no splinted under oblique forces."
- Rosettii JPD 2010

SPLINTING
NO DIFFERENCE IN TILTED VS AXIAL

- Malo, Rangert, CID&RR 2005
- Calandriello R, COIR, 2004,2005
- Agliardi Clin Oral Impl Res 2010

AO4 IMPLANT SUCCESS

- Aparicio CID&RR 2001 100%
- Calandriello CID&RR 2005 96.7%
- Malo, Rangert CID&RR 2005 97.6%
- Testori Clin Oral Impl Res 2008 98.8%
- Agliardi Clin Oral Impl Res 2010 96.5%
- Babbush Journal of Impl 2011 99.3%

Ten-year survival rates of fixed prostheses on four or six implants ad modum Bränemark in full edentulism

Bränemark P-I, Svensson B, van Steenberghhe D

A longitudinal study of the survival of All-on-4™ implants in the mandible with up to 10 years of follow-up

Malo P, Nobre M, Lopes A, Moss S, Molina G
J Am Dent Assoc 2011;142:310-320

- 245 patients
- 980 implants
- up to 10 years’ fixed restoration survival is 99.2%
HOW DO WE TRANSFORM THIS? INTO THIS?

TODAY!!

ANATOMY OF THE MAXILLA

WHEN IS THE RIGHT CHOICE?

- Zone 1 – Canine to Canine
  Present
- Zone 2 – Bicuspid
  Present
- Zone 3 – Molar
  Absent
ALL-ON-4 TREATMENT CONCEPT

CONE-BEAM CT SCAN
CBCT
CBCT AS A VALID PREDICTOR

- Norton RM, COIR, 2001
- Shahlaie, IJOMI, 2003
- Beer, COIR, 2003
- Shapurian, 2006
- Lee, IJOMI
- Turkyilmaz, I, CID&RR, 2009
- Valiyaparambil, JVm IJOMI 2012
ALL-ON-4 SOLUTION – MANDIBLE

- Full Face, Lips at Repose
- No animation – with and without Denture/Partial
- Full Face Smiling – with and without Denture/Partial
- Lips Retracted, Teeth apart – with and without Denture/Partial
- Lips Retracted, Teeth together – front, right, and left sides
- Side Profile, Full Face
- Side Profile, Smile
- Intra-oral Alveolar Ridge without Denture
- Denture out of Mouth: Occlusal View and Intaglio View

ESTABLISH VERTICAL DIMENSION OF OCCLUSION (VDO)
EXTRACTIONS

ALVEOLECTOMY

ACRYLIC BUR (PINEAPPLE)
ADEQUATE BONE REDUCTION

REDUCTION CHECK
ALL-ON-4 SOLUTION – MAXILLA
SATISFACTION

I want to thank everyone for helping me today. I'm very happy that I finally have good teeth to eat.

RESTORATIVE WORK
INDEX MULTI-UNIT ABUTMENT POSITION W/BLUE MOUSSE

HOLLOW OUT SPACE FOR TEMPORARY COPINGS

HOLLOW OUT SPACE FOR TEMPORARY COPINGS

ATTACH TEMPORARY COPINGS TO MULTI-UNIT ABUTMENTS
TRY-IN DENTURE FOR PASSIVE FIT

COLD CURE ACRYLIC TO PICK-UP TEMPORARY COPINGS

UNSCREW DENTURE WITH TEMPORARY COPINGS

CONTOUR IMPLANT BRIDGE
POLISH & SMOOTH BRIDGE - REMOVE SHARP ANGLES

OSSEOINTEGRATION

Stability of Dental Implants Over Time

- Total stability
- Biological stability
- Mechanical stability

Graph showing the stability over time with different types of stability.
NobelProcera™ Bar Try-in

NobelProcera™ Bar Opaquing for Processing

Seat the Final Prosthesis

Seat the Final Prosthesis
MODIFICATIONS

Fill in Screw Access Holes

TRANSALVEOLAR

• Jensen, O, Adams, M
M-TECHNIQUE

A

2. Establish alveolar plane
10. Bone stock for grafting

1. Prosthetic restorative space
IT IS NOT A NEW THING…
ZYGOMATICUS
IT IS NOT A NEW THING…
ZYGOMATICUS

IT IS NOT A NEW THING…
ZYGOMATICUS

IT IS NOT A NEW THING…
PTERYGOID-MAXILLARY IMPLANTS
HYGIENE

HYGIENE AT THE OFFICE

• TP products
• X-rays every year
• Hygiene q6 to 12 months
• No probing
• Do not remove the bridge

HYGIENE AT HOME

• Tp products
• Superfloss
• Waterpik or Monoject
• Soft brush
• Non abrasive tooth paste
• Mouthwash

PITFALLS - PAREL

<table>
<thead>
<tr>
<th></th>
<th>Jaws</th>
<th>Implants</th>
<th>Failed</th>
<th>Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>285</td>
<td>1140</td>
<td>41</td>
<td>96.53%</td>
</tr>
<tr>
<td>Mandible</td>
<td>273</td>
<td>992</td>
<td>7</td>
<td>99.30%</td>
</tr>
<tr>
<td>Total</td>
<td>558</td>
<td>2132</td>
<td>48</td>
<td>97.8%</td>
</tr>
</tbody>
</table>

FAILURE PROFILE OF THE MAXILLA

- Opposing Dentition
- Opposing Implants
- Implant Type
- Insertion Torque
- Bruxer
- Smoker
- Posterior Implant

- Anterior Implants
- Drug Abuse
- Systemic Factors
- Local Infection
- Bone Density
- Bone Availability
- Gender

AT RISK PATIENT

- Primary Factors:
  - Opposing Natural Dentition
  - Poor Bone Density
  - Bruxing
  - Gender

- Secondary Factors:
  - Smoking
  - Bone Volume

TAKE HOME INFORMATION

ALL-ON-10 OR 12

“It’s all about immediate load”
– Steve Parel

“It’s not the number of implants, but the Anterior-Posterior spread that is important.”
– Lambert, Weber, Belser JPD 2009

BIOMECHANICS

• Tilting implants causes the force on the implants to be less not greater... because the AP spread is greater

• John Brunski
### WHY ANGLE IMPLANTS

- Increase AP Spread
- Increase Implant Length
- Apical Fixation in Basal Bone
- Insertion Torque
- Avoid Sinus and Nasal Cavities

### IMPLANT TEAM

- Avoid Bone Grafting
- Decrease implant number
- Immediate Function
- Immediate Splinting

- Design the case
- How many implants should we use? Position? Loading protocol?
- Tilt the implants or upright
- Use of cantilevers. How long?
- What are the warning signs of failure

---

THANK YOU