Role of the implant design on immediate loading

Critical appraisal of the evidence from clinical trials

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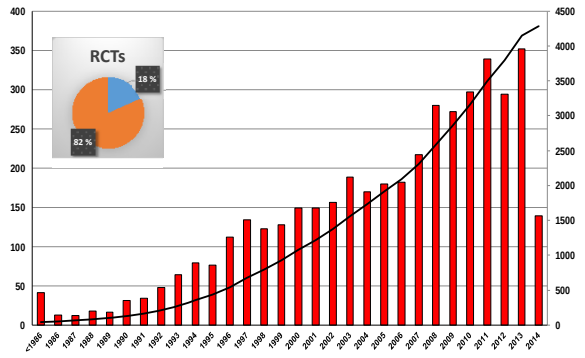
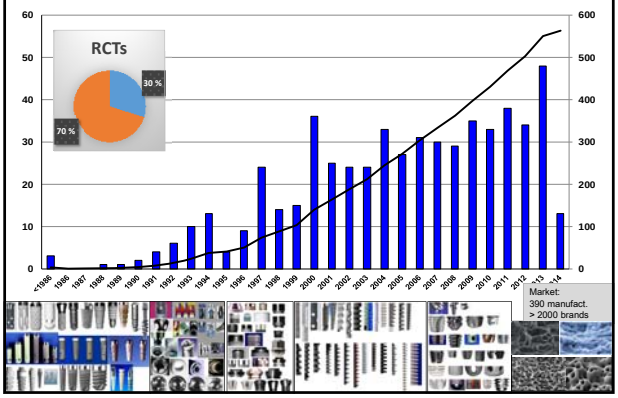
Publications reporting data from clinical studies on dental implants (n=4309)



Publications on clinical studies on dental implants, with focus on effects of implant design factors (n=566)



«Immediate function» - terms

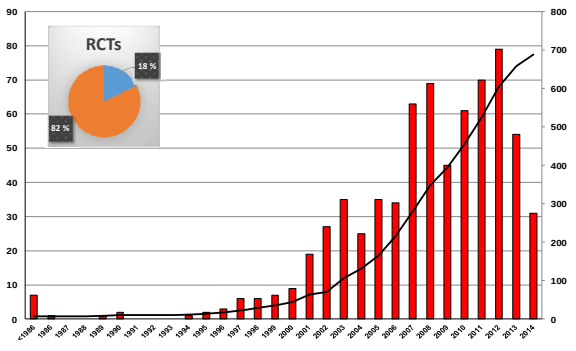
Patient
A patient with an **edentulous space or jaw** desiring immediate restoration of form and function i.e., «*immediate loading**»
A patient with a **terminal tooth or dentition** desiring immediate restoration of form and function i.e., «*immediate implant*» / «*immediate placement*» *pluss* «*immediate loading*»*

*«Functional loading» *AKA occlusal loading*
or
«Nonfunctional loading» = («*Immediate restoration*»)

«Immediate function» modalities -

In **one** treatment session: 1. Extraction + Placement of implant + Restoration (Temporary or permanent) *Type 1* *(direct) (late) Immediate loading*	In **two** treatment sessions: 1. Extraction Soft tissue coverage **(Healing ~4 to 8 weeks)** 2. Placement of implant + Restoration *Type 2*	In **two** treatment sessions: 1. Extraction Partial socket bone fill **(Healing ~8 to 16 weeks)** 2. Placement of implant+ Restoration *Type 3*	In **two** treatment sessions: 1. Extraction Fully healed socket **(Healing ~>16 weeks)** 2. Placement of implant + Restoration *Type 4*
In **two** treatment sessions: 1. Extraction + Placement of implant **(Healing 1 week)** 2. Restoration (Temporary or permanent)	In **three** treatment sessions: 1. Extraction Soft tissue coverage **(Healing ~4 to 8 weeks)** 2. Placement of implant **(Healing 1 week)** 3. Restoration	In **three** treatment sessions: 1. Extraction Partial socket bone fill **(Healing ~8 to 16 weeks)** 2. Placement of implant **(Healing 1 week)** 3. Restoration	In **three** treatment sessions: 1. Extraction Fully healed socket **(Healing ~>16 weeks)** 2. Placement of implant **(Healing 1 week)** 3. Restoration
In **two** treatment sessions: 1. Extraction + Placement of implant **(Healing 1 to 8 weeks)** 2. Restoration (Temporary or permanent) *Early loading*	In **three** treatment sessions: 1. Extraction Soft tissue coverage **(Healing ~4 to 8 weeks)** 2. Placement of implant **(Healing 1 to 8 weeks)** 3. Restoration	In **three** treatment sessions: 1. Extraction Partial socket bone fill **(Healing ~8 to 16 weeks)** 2. Placement of implant **(Healing 1 to 8 weeks)** 3. Restoration	In **three** treatment sessions: 1. Extraction Fully healed socket **(Healing ~>16 weeks)** 2. Placement of implant **(Healing 1 to 8 weeks)** 3. Restoration
In **two** treatment sessions: 1. Extraction + Placement of implant **(Healing > 8 weeks)** 2. Restoration (Temporary or permanent) *Conventional loading*	In **three** treatment sessions: 1. Extraction Soft tissue coverage **(Healing ~4 to 8 weeks)** 2. Placement of implant **(Healing > 8 weeks)** 3. Restoration	In **three** treatment sessions: 1. Extraction Partial socket bone fill **(Healing ~8 to 16 weeks)** 2. Placement of implant **(Healing > 8 weeks)** 3. Restoration	In **three** treatment sessions: 1. Extraction Fully healed socket **(Healing ~>16 weeks)** 2. Placement of implant **(Healing > 8 weeks)** 3. Restoration

Publications reporting data from clinical studies on dental implants, with focus on immediate loading (n=693 / 4309 reports)



General findings on immediate loading

693 reports

Systematic reviews: 53 (11 in last 2 years)

First clinical research study: 1968 – 1975 (Brånemark et al. 1977: Experience over a 10-year period & 4 tps-implants anterior mandible (Ledermann 1978)

Longest clinical research study: 44p/176i over 12 years (range 8-18), retrospective study, ITI-tps anterior mandible (Lambrecht & Hodel 2007)

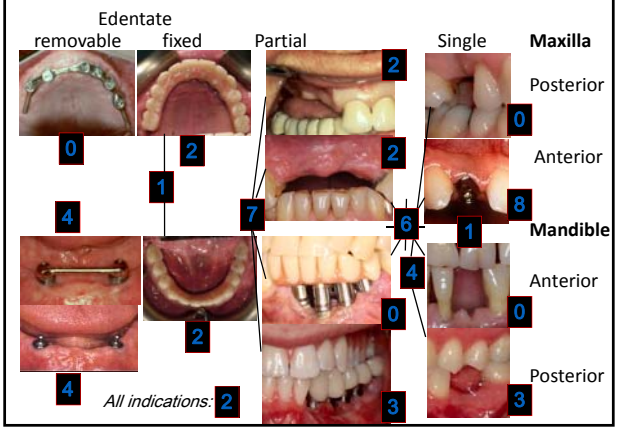
#RCT trials: 121 reports (18 in last 2 y.), 76 focus on loading comp., 51 unique RCTs

First: 10 p. with 40 Nobelbiocare Mk2 i. edent.mand. OD (Chiapasco et al. 2001)

Largest: 266 p. with 325 Straumann SLA i. for crown/3-4i-FDP(Zöllner et al. 2008)

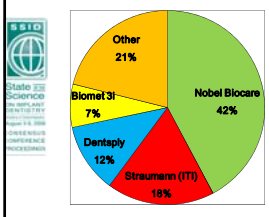
Longest: 10 y. 106p/212i/2i-OD (Ma et al. 2010) & 9 y. 44p/121i (Rocci et al. 2013)

121 RCT papers → 76 comparing healing protocols, 51 unique RCTs

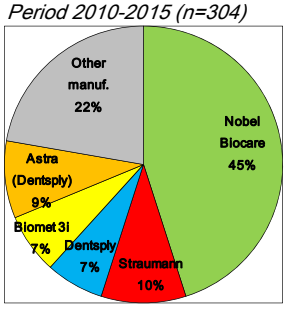


Clinical trials with focus on shortened loading protocols according to implant brand

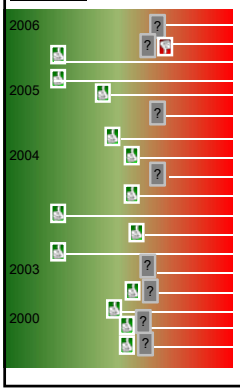
Prior to 2006 (n=186)



Period 2010-2015 (n=304)



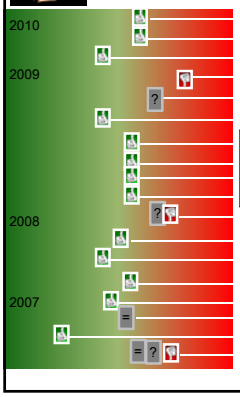
Immediate loading vs. healing
(SR s 2000- 2006)



Glauser et al. (17 reports) *
Nkenke & Fenner (38)
Del Fabbro et al. (71)
Ioannidou & Doufexi (Early loading, 13)
Cooper et al. (Edent. Maxilla (9))
Attard & Zarb (93) *
Esposito et al. (RCTs (7))
Misch et al. (24) *
Morton et al. / Chiapasco (Edent.(45)
Ganeles&Wismeijer (Single/Part.Edent.(25))
Romanos (Implant brand A (10)) *
Misch et al. (72) *
Castellon et al. (Mandible anterior (14))
Esposito et al. (RCTs (3))
Lekholm (15) *
Aparicio et al. (45)
Gapski et al. (26) *
Szmukler-Moncler et al. (Vitro & vivo (22))

*discuss possible effects of implant design factors

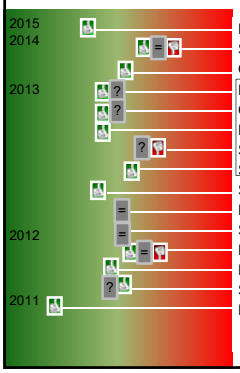
Immediate loading vs. healing
(2007- 2010)



Ma & Payne (Mand. 2i-OD (25))
Alsabeeha et al. (Mand. OD (10))
Atieh et al. (Postextraction single molars (9)) *
Atieh et al. (Single (5))
Atieh et al. (Postextraction single (10)) *
Esposito et al. (RCTs(22))
Gallucci et al. (Edentulous (61))
Roccuzzo et al. (PartialEdent.Post.Max. (8))
Cordaro et al. (Earlyload. PartialEd.Post.Mand. (19))
Grutter & Belser (PartialEdent. Anterior (10))
DeRouck ea (Postextraction single anter. (11))
Henry & Liddelow ("20 best papers")
Sennerby & Gottlow (Publications>2005 (6))
Den Hartog et al. (PartialEdent. Anterior (19))
Esposito et al. (RCTs(11))
Kawai & Taylor (Mand. OD (9))
Avila et al. (28)
Jokstad & Carr (RCT+CCTs (22))

*discuss possible effects of implant design factors

Immediate loading vs. healing
(2011-2015)



Del Fabbro et al. (Postextraction, (50)) *
Sanz-Sanchez et al. (RCTs (29))
Chrcanovic et al. (Occl vs Non-occl. (11))
Benic et al. (Single, RCTs, (11))
Chen & Buser (Postextraction ant. Maxilla (50))
Papaspyridakos et al. (Edent. Fixed. (62))
Schimmel et al. (Edent. Remove., (58))
Schrott et al. (Part. Edent. (24))
Su et al. (RCTs, 26)
Esposito et al. (RCTs (26))
Suarez et al. (6)
Lang et al. (Postextraction, (46))
Menini et al. (All-on-4, (11)) *
Strub et al. (9) *
Enríquez-Sacristán et al. (Postextraction (13))

*discuss possible effects of implant design factors

General findings on immediate loading

693 reports

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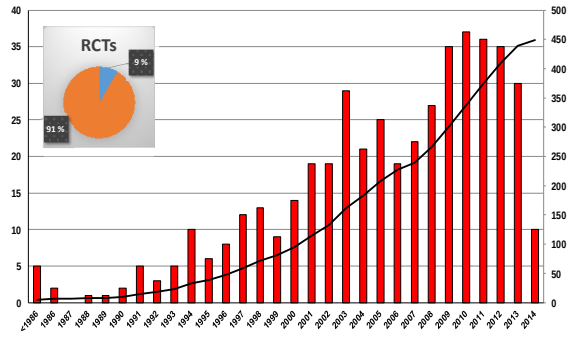
Pre-surgery modifiers
General & local risk factors
Bone quantity and quality (jaw)
Vertical dimension of occlusion
Parafunctional habits

Surgery modifiers ?
Flap / Site preparation
Primary stability

Additional modifiers?
Single implant vs. Splinted implants
Occluding vs. Non-occluding
Implant design, including length

Publications reporting data from clinical studies on dental implants, with focus on immediate implants (n= 462 / 4309 reports)



General findings on immediate implants

462 reports

Systematic reviews: 22 (11 in last 2 years)

First clinical research study: Single Tübinger-implants Al_2O_3 (Schulte 1978)

Longest clinical research study: Retrospective data of 1608 i./981p. over 25y. Nobel Biocare implants (Balshi et al. 2013)

#RCT trials: 51 (9 in last 2 years)

First: 36p./43i, Ti-tps vs Ti_HA +/- DFDB (Gher et al. 1994)

Largest: 208 p./ i. Straumann-SLA, after 3 weeks healing (Lang et al. (2007)

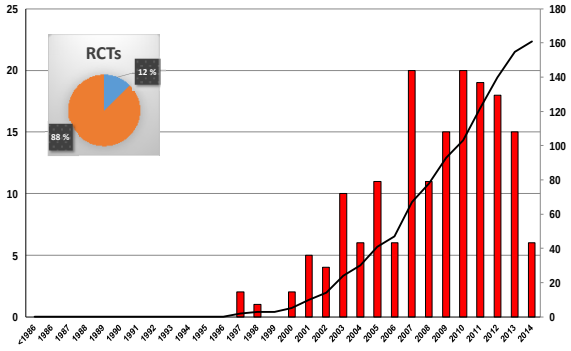
Longest follow up: 3 y. 93p/99i Osseospeed (Sanz et al. 2010) & (10 y. 72p/i. Osseotite, placement 10days after extraction (Schropp et al. 2010)

Pre-surgery modifiers
General & local risk factors
Bone quantity and quality (jaw)
Vertical dimension of occlusion
Parafunctional habits

Surgery modifiers?
Flap / Site preparation
Primary stability
Residual infection
Socket defect shape & facial plate integrity/thickness
Facial position of the implant
Soft tissue biotype

Skill of Clinician(s)

Publications reporting data from clinical studies on dental implants, with focus on immediate implants with immediate loading (n= 161 / 693 reports)



General findings, immediate implants with immediate loading

161 reports

Systematic reviews: 9 (2 in last 2 years)

First clinical research study: 10p./130i, retrosp., edent.mand., Brånemark turned i. (Balshi & Wolfinger 1997)

Longest clinical research study: 7 y., retrosp., 80p/519i., edentulous jaws, 3i. Implants, (Testori et al. 2013)

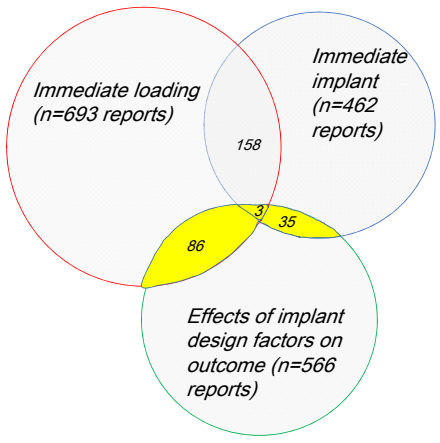
#RCT trials: 18 (4 in last 2 years)

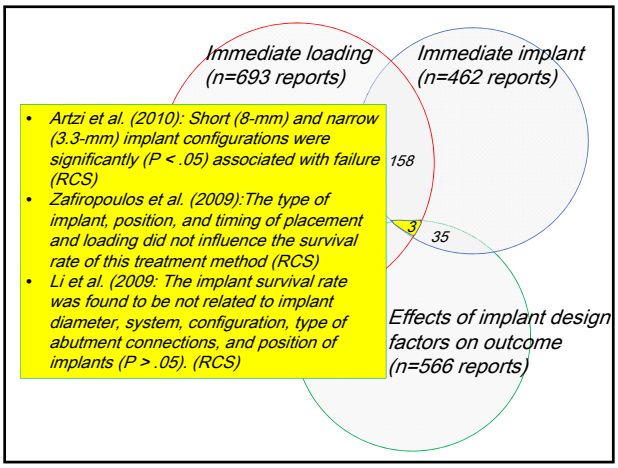
First: vs.:(ii+dl) 40p.(Crespi ea. 2008)–(i. autograft,heal 4 m., il),76p. (Block ea. 2009)

Largest: vs. Xenograft+membrane, heal 4m.,+il, 106p., single max. (Felice et al. 2011)

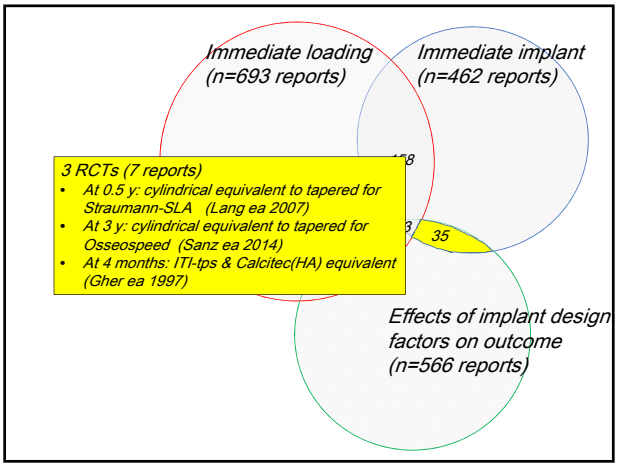
Longest follow up: 5 years 71p/120i, single posterior, (Prosper et al. 2010)

Pre-surgery modifiers	Surgery Modifiers?	Skill of Clinician(s)	Additional modifiers?
General & local risk factors Bone quantity/quality (jaw) Vertical dimension of occlusion Parafunctional habits	Flap / Site preparation Primary stability Residual infection Socket defect shape & facial plate integrity/thickness Facial position of the implant Soft tissue biotype		Single implant vs. Splinted implants Occluding vs. Non-occluding Implant design, including length

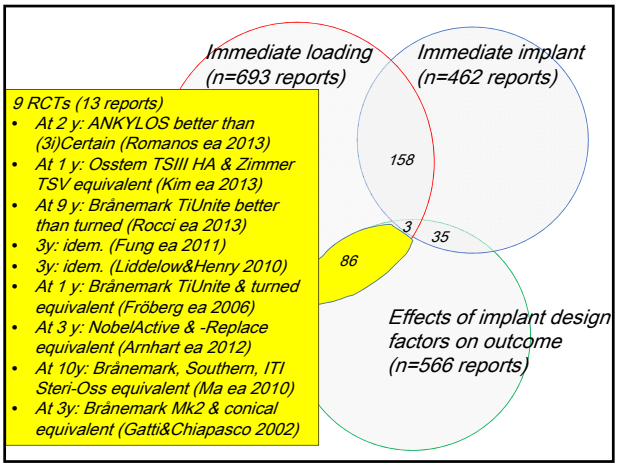




- *Artzi et al. (2010): Short (8-mm) and narrow (3.3-mm) implant configurations were significantly (P < .05) associated with failure (RCS)*
- *Zafiropoulos et al. (2009):The type of implant, position, and timing of placement and loading did not influence the survival rate of this treatment method (RCS)*
- *Li et al. (2009: The implant survival rate was found to be not related to implant diameter, system, configuration, type of abutment connections, and position of implants (P > .05). (RCS)*



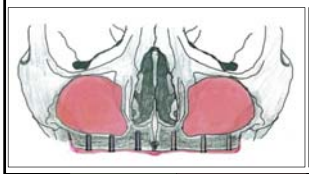
3 RCTs (7 reports)
- *At 0.5 y: cylindrical equivalent to tapered for Straumann-SLA (Lang ea 2007)*
- *At 3 y: cylindrical equivalent to tapered for Osseospeed (Sanz ea 2014)*
- *At 4 months: ITI-tps & Calcitec(HA) equivalent (Gher ea 1997)*



9 RCTs (13 reports)
- *At 2 y: ANKYLOS better than (3i)Certain (Romanos ea 2013)*
- *At 1 y: Osstem TSIII HA & Zimmer TSV equivalent (Kim ea 2013)*
- *At 9 y: Brånemark TiUnite better than turned (Rocci ea 2013)*
- *3y: idem. (Fung ea 2011)*
- *3y: idem. (Liddelow&Henry 2010)*
- *At 1 y: Brånemark TiUnite & turned equivalent (Fröberg ea 2006)*
- *At 3 y: NobelActive & -Replace equivalent (Arnhart ea 2012)*
- *At 10y: Brånemark, Southern, ITI Steri-Oss equivalent (Ma ea 2010)*
- *At 3y: Brånemark Mk2 & conical equivalent (Gatti&Chiapasco 2002)*

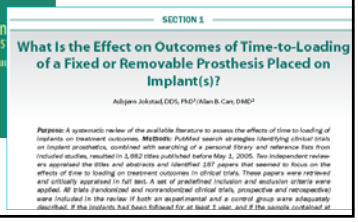
Summit 2014

Edentulous maxilla, effects of implant design in rehabilitation, studies on immediate loading



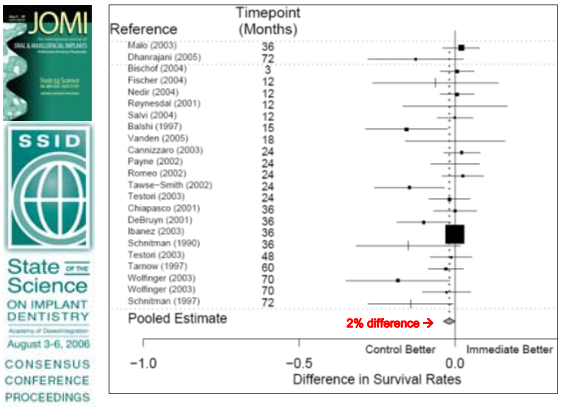
	YES	NO
Design	Degidi & Piatelli 2003	Testori ea 2013 Li ea 2009
Diameter	Degidi ea 2005	Testori ea 2013 Li ea 2009
Length	Kinsel & Liss 2007 Artzi ea 2010	vanAssche ea 2012 Testori ea 2013 Li ea 2009 Ibanez ea 2005
Surface		
Material		

	YES	NO
Design	Agnini ea 2014 Malo ea 2011a	Malo ea 2012 Cavalli ea 2012 Malo ea 2011b Agliardi ea 2009
Diameter		
Length		
Surface		Pera ea 2014
Material		



187 titles on immediate loading → 22 papers reporting on 19 RCT/CCT trials

Relative Differences in Survival Estimates



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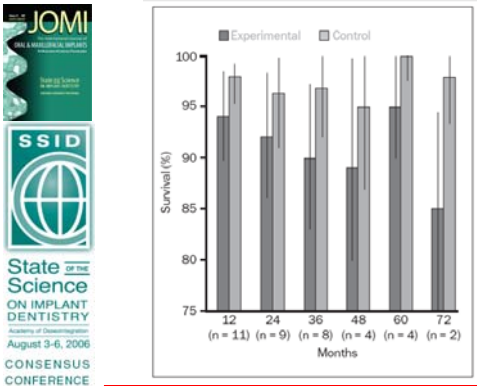
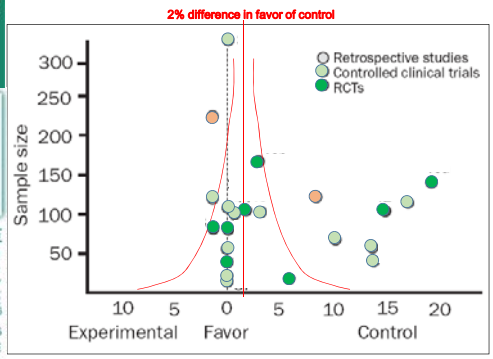


~2% lower survival & consistently wider confidence intervals

Implant morphology (smooth, microrough, rough)



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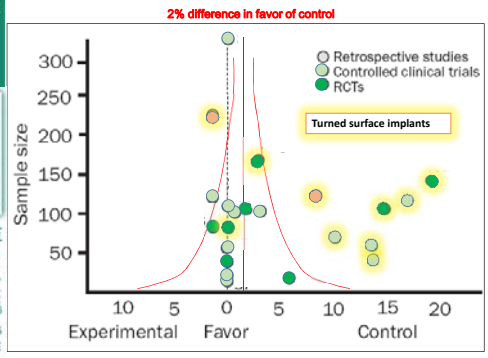

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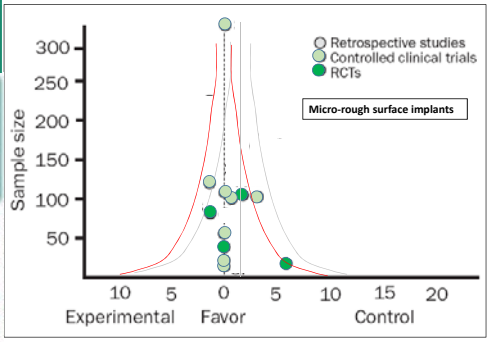

Thank you for your attention

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