



RESONANCE FREQUENCY ANALYSIS AS A PROGNOSTIC DETERMINANT FOR IMPLANT OUTCOMES

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Osseointegration

IMPLANT STABILITY

The most important criterion for successful osseointegration

- Primary: biomechanical stability upon implant insertion
- Secondary: stability from new bone formed around implant after osseointegration

METHODS TO MEASURE IMPLANT STABILITY

Insertion torque

Percussion

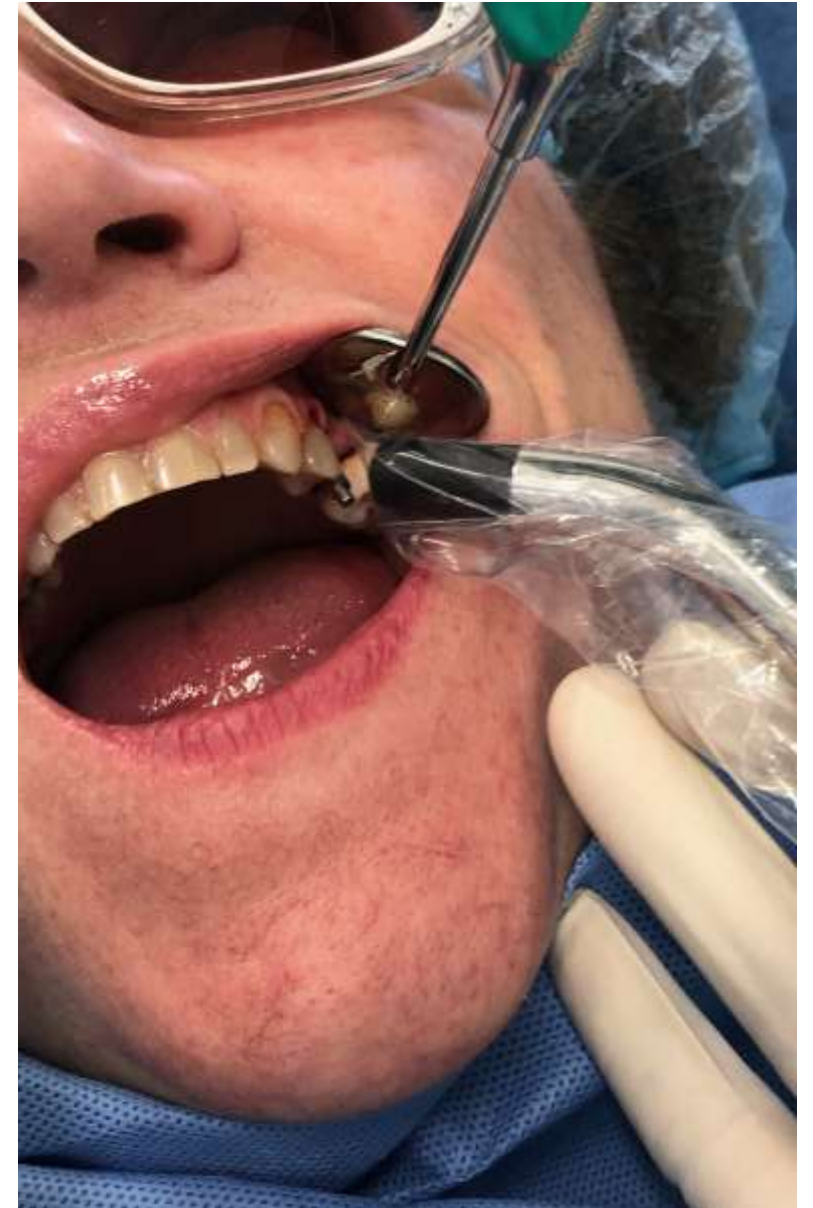
Reverse torque

Resonance
Frequency
Analysis with
Osstell ISQ



WHAT IS OSSTELL
IMPLANT
STABILITY
QUOTIENT (ISQ)?

CLINICAL APPLICATION



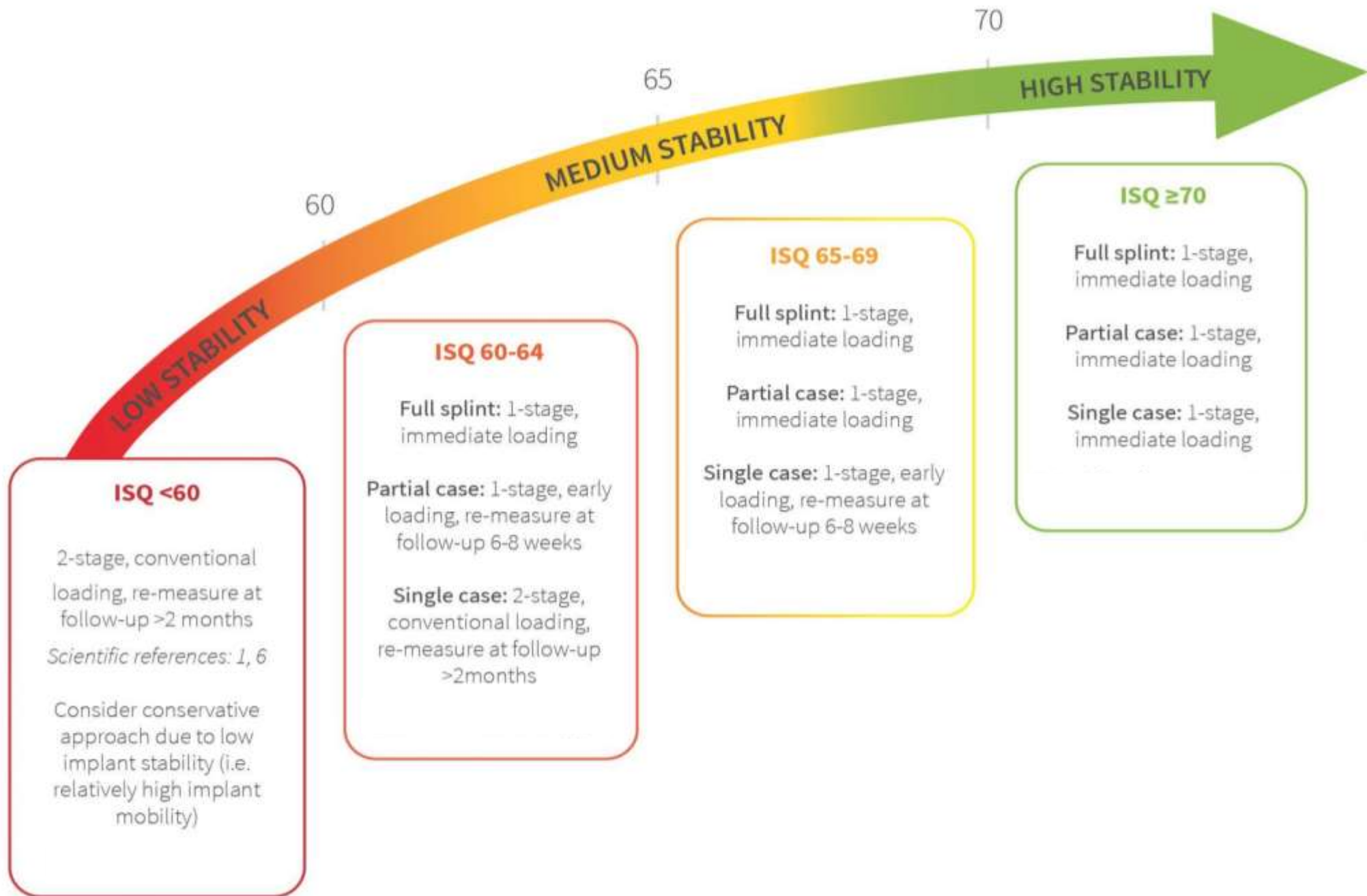


ISQ VALUES

≥ 70 : high stability

60-69: medium stability

< 60 : low stability



LOW STABILITY

ISQ <60

2-stage, conventional loading, re-measure at follow-up >2 months

Scientific references: 1, 6

Consider conservative approach due to low implant stability (i.e. relatively high implant mobility)

ISQ 60-64

Full splint: 1-stage, immediate loading

Partial case: 1-stage, early loading, re-measure at follow-up 6-8 weeks

Single case: 2-stage, conventional loading, re-measure at follow-up >2 months

MEDIUM STABILITY

ISQ 65-69

Full splint: 1-stage, immediate loading

Partial case: 1-stage, immediate loading

Single case: 1-stage, early loading, re-measure at follow-up 6-8 weeks

HIGH STABILITY

ISQ ≥70

Full splint: 1-stage, immediate loading

Partial case: 1-stage, immediate loading

Single case: 1-stage, immediate loading

DEFINITIONS

Implant failure: an endosseous implant that was placed and subsequently removed due to loss of osseointegration or terminal bone loss.

Peri-implantitis: progressive bone loss, presence of suppuration, inflammation, infection, or pain.



IMPLANT FAILURE

- Terminal bone loss
- Suppuration, infection, inflammation, pain
- Removal necessary

CURRENT EVIDENCE ON ISQ AND IMPLANT FAILURE

Retrospective study by Chen et al. (2019): initial ISQ < 52 might indicate higher failure risk

Andersson et al (2019): ISQ <70 at placement or <75 at 3-4 months post placement → significantly higher risk for implant failure

CURRENT EVIDENCE ON ISQ AND PERI-IMPLANTITIS

Ex vivo study by Yao et al. (2017): ISQ values can be used to detect narrow intrabony marginal bone defects → early diagnosis of peri-implantitis

Animal study by Monje et al. (2018): strong negative correlation between ISQ and marginal bone loss

- A decrease in one ISQ unit = 1 mm of marginal bone loss

OBJECTIVE

To study the correlation of ISQ values, peri-implantitis and implant failures.



STUDY DESIGN

Chart review of 1,319 implant placement at Post Grad Perio from 01/2015 to 12/2019
Only charts with ISQ values at placement were included (903 implants on 454 patients)

Primary analysis: Implant complications vs ISQ

Success: implants placed, restored and still in function with no pain or symptoms

Peri-implantitis: PA radiographs, records mentioning peri-implantitis, use of i-brush to decontaminate

Implant failure: implants removed due to loss of osseointegration or terminal bone loss

Secondary analysis

Age and Gender

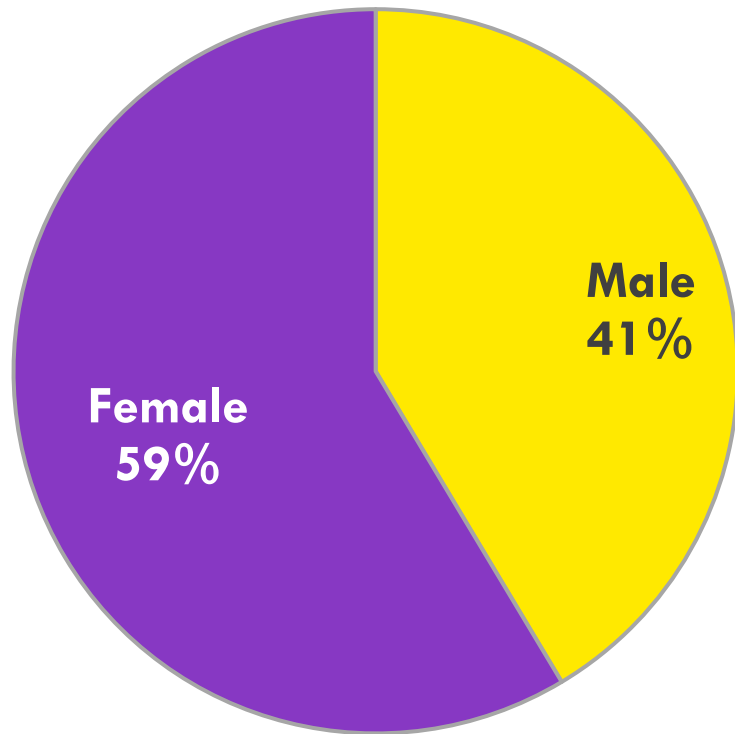
Implant brands, length, width, ISQ, position of arch

STATISTICAL ANALYSIS

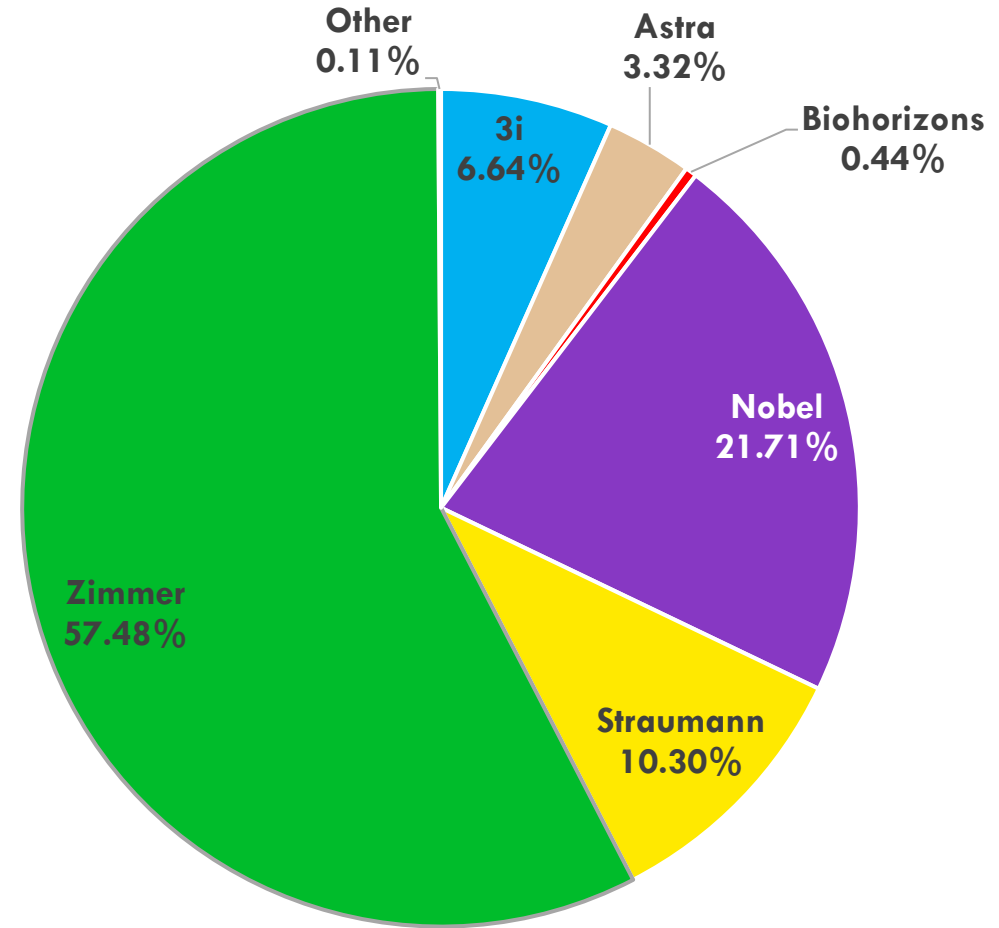
- Fisher's exact test to determine association between 7 parameters vs implant outcomes
 - Parameters:
 - **Primary: ISQ values**
 - Secondary: age, gender, implant brands, width, length, position of the arch
 - Outcomes: failure and peri-implantitis

RESULTS

- 903 implants on 454 patients met inclusion criteria



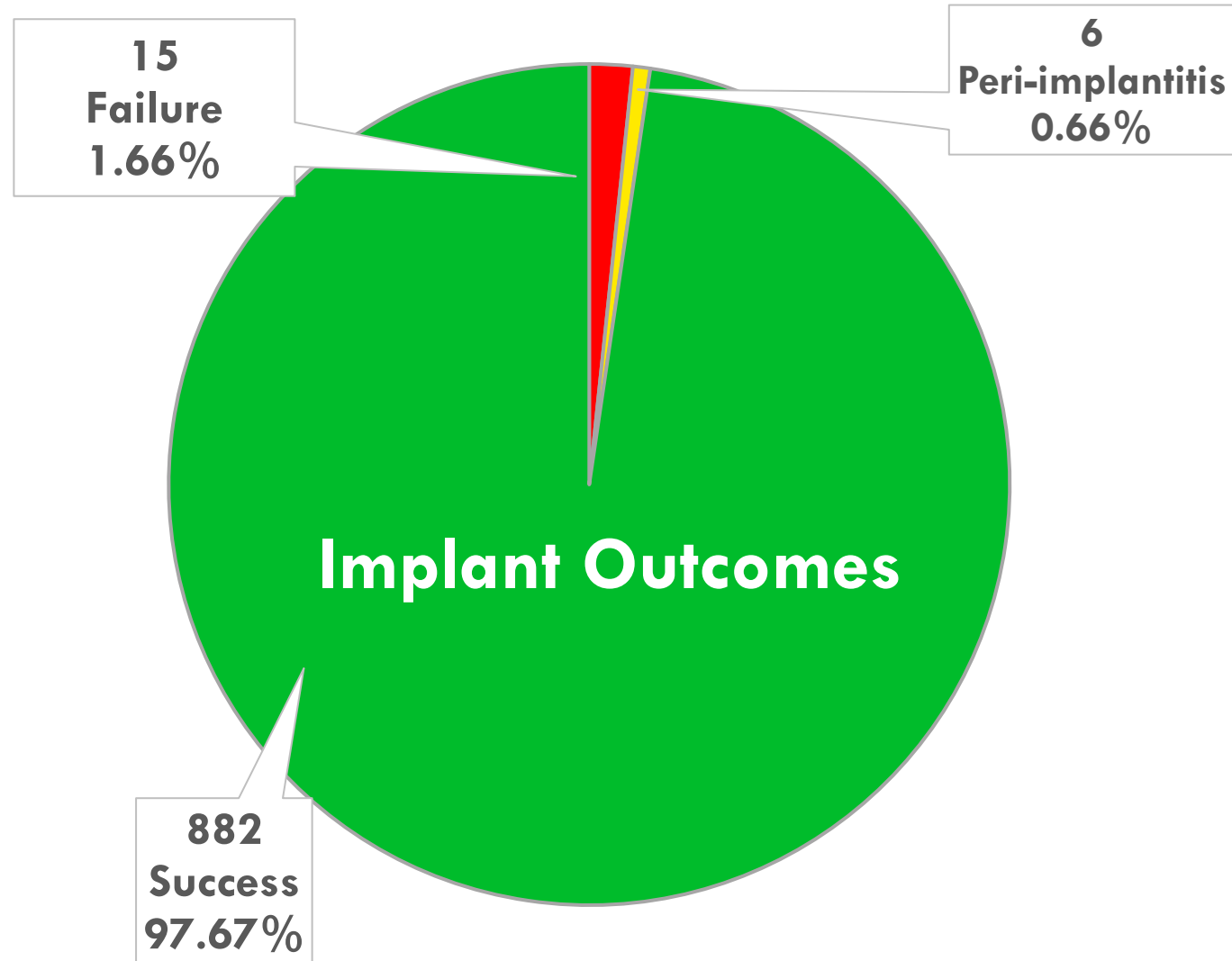
Male Female



3i Astra Biohorizons Nobel Straumann Zimmer Other

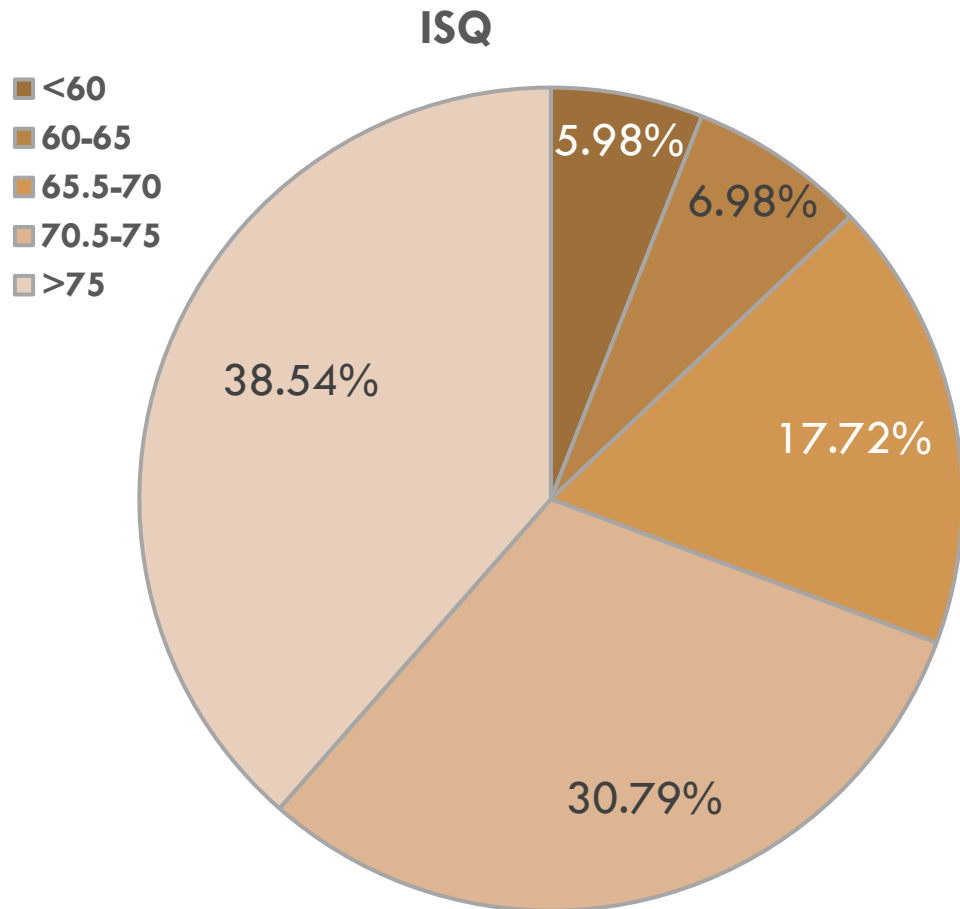
RESULTS

- Failure
- Peri-implantitis
- Success



RESULTS

- No significant correlation found between ISQ values and implant outcomes (P value 0.2996)

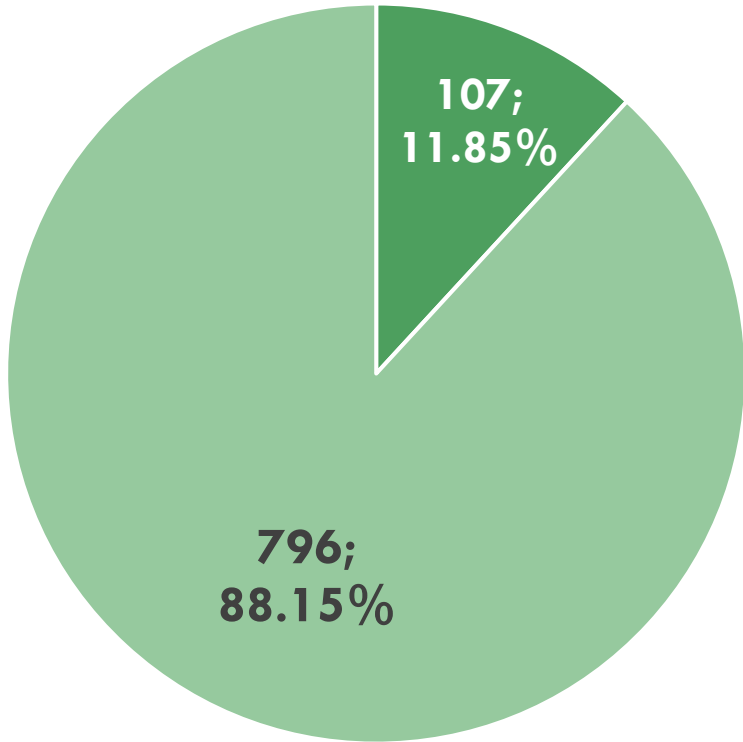


ISQ	Number	Peri-implantitis	Failed
<60	54	0	4 (7.4%)
60-65	63	0	0
65.5-70	160	1 (0.63%)	2 (1.25%)
70.5-75	278	2 (0.72%)	4 (1.44%)
>75	348	3 (0.86%)	5 (1.44%)

RESULTS

- Statistically significant association between length and implant outcomes (P value 0.0002)
- Shorter length is associated with more peri-implantitis (P value 0.0001)

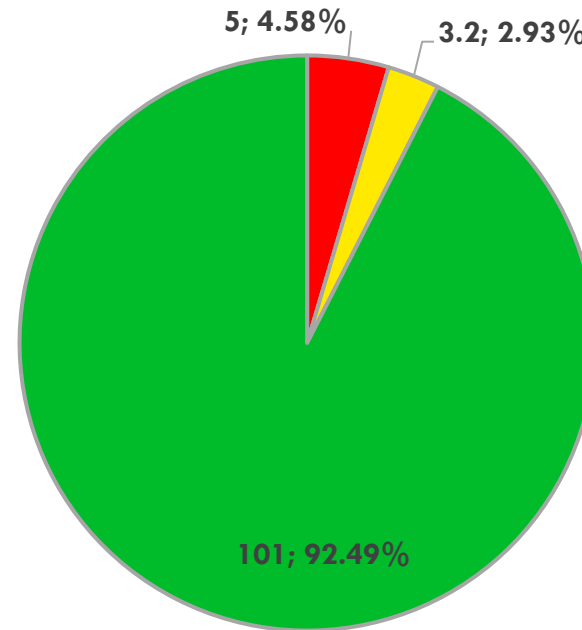
Length



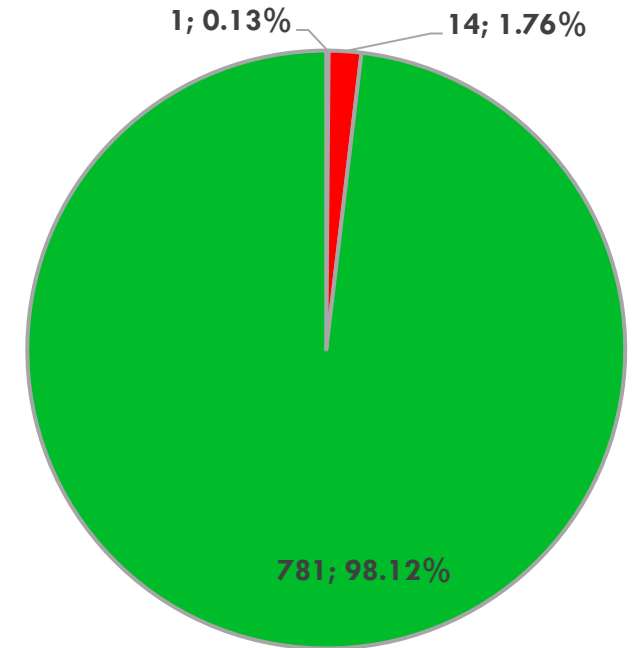
■ Peri-implantitis

■ Failure

■ Success



<10mm



≥10mm

■ <10 mm ■ ≥10 mm

LENGTH VS IMPLANT OUTCOMES

- There is a statistically significant association between length and implant outcomes (P value 0.0002)
- Shorter length is associated with more peri-implantitis (P value 0.0001)

RESULT

- No significant association was found between other parameters: Age, Gender, Implant Brands, Width, Position of the Arch and Implant Outcomes

KEY FINDINGS

There was no statistically significant association between ISQ values and implant outcomes

Length of implant was found to be significantly associated with implant failure and peri-implantitis

Peri-implantitis rate is 0.66% - significantly lower than reported 10% rate in literature

Most patients were not followed up past 3 months of definitive implant prostheses delivery



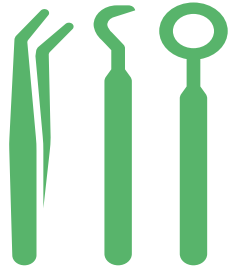
Implant length <10mm was associated with higher peri-implantitis

Implant length \geq 10mm was associated with higher failure rate

CONCLUSION

- Resonance Frequency Analysis ISQ values are not predictive of implant outcomes

LIMITATIONS



Lack of diagnostic code



Retrospective nature



Lack of long-term follow ups on peri-implantitis rate

REFERENCES

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THANK YOU!

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thank you