Investigation of Deviations in Immediate Implant Placement with Different Implant Fixture Shapes Using Computer-Assisted Surgery: A Cadaver Study

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Background

Although the aggressive thread design of implants can achieve adequate primary stability during immediate implant placement (IIP), it may lead to greater deviation from the planned position due to the self-cutting nature of the threads. A new implant thread design was developed with a less aggressive thread profile to guide implant positioning while still ensuring sufficient primary stability.

This cadaver study aimed **to compare placement accuracy between two implant system with different thread designs** under a fully guided flapless IIP protocol.

Materials and Methods

Cadaver specimens selection: Maxillary (n=4), Mandible (n=1)

Inclusion criteria
(a)adequate alveolar bone
(b)absence of significant bony defects

CADCAM phase (IOS + CBCT, Surgical guide design & fabrication)

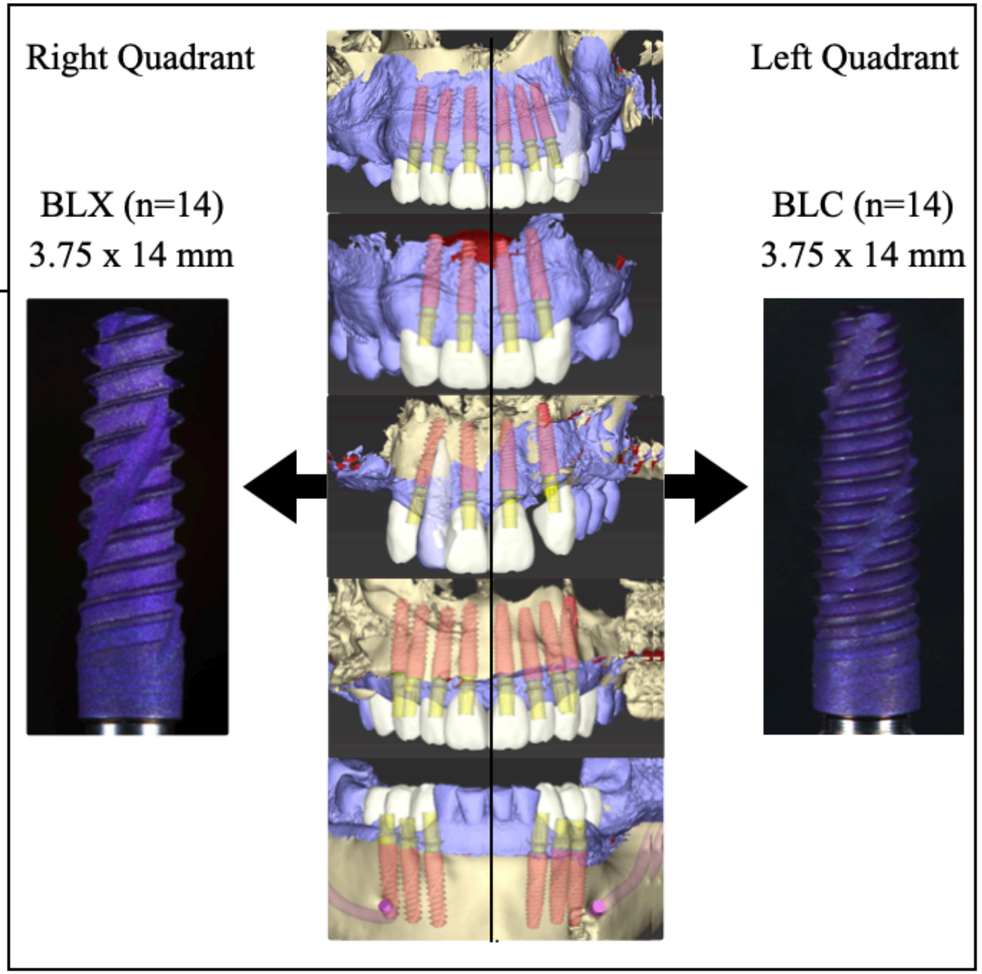
Surgical procedure (IIP)

BLX(n=14)

BLC(n=14)

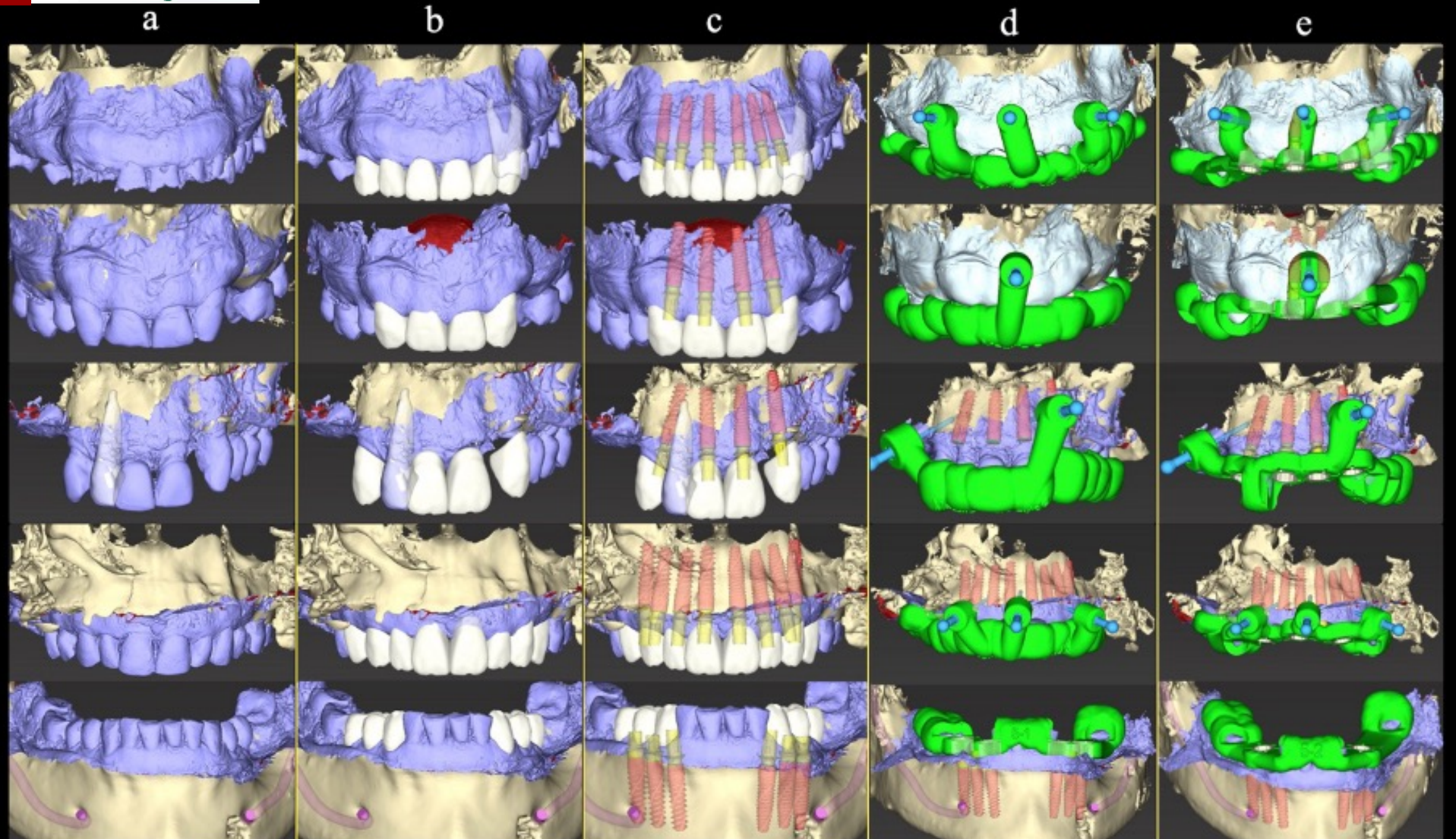
Torque value, ISQ, and Deviation measurement

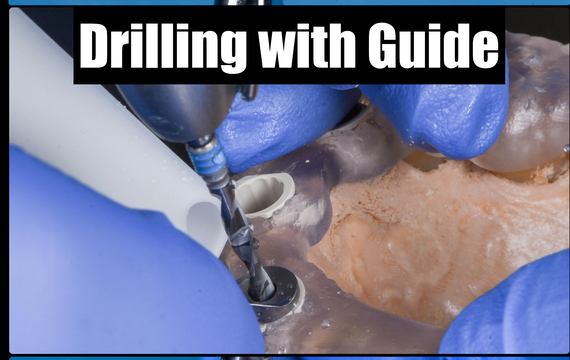
Split mouth design



Academy of Osseointegration

Digital Implant Planning using CoDiagnostiX Software





Results

ISQ	BLX (N=14) Mean	BLX (N=14) SD	BLC (N=14) Mean	BLC (N=14) SD	P-Value
Mesial	59.143	10.819	62.786	8.192	0.544
Buccal	58.714	9.918	61.429	9.205	0.337
Distal	59.071	11.579	62.571	9.936	0.493
Palatal	59.000	10.100	61.643	9.279	0.374

	BLX (N=14) Mean (Ncm)	BLX (N=14) SD	BLC (N=14) Mean (Ncm)	BLC (N=14) SD	P-Value
Torque	24.500	12.990	20.786	8.894	0.024*

- BLX implants showed higher insertion torque than BLC.

Deviation type	BLX (N=14) Mean (mm)	BLX (N=14) SD	BLC (N=14) Mean (mm)	BLC (N=14) SD	P-Value
Global deviation					
Coronal	0.704	0.292	0.898	0.410	0.736
Apical	1.096	0.587	1.314	0.475	0.845
Angular deviation	2.155	1.669	2.845	1.277	0.222
Depth deviation					
Absolute value	0.324	0.346	0.620	0.498	0.691
Considering direction	0.094	0.472	0.093	0.807	0.063
Lateral deviation					
Coronal	-0.009	0.436	0.354	0.369	0.096
Apical	-0.122	1.090	0.539	1.072	0.168
Bucco-lingual deviation					
Coronal					
Absolute value	0.324	0.264	0.327	0.256	0.254
Considering direction	0.285	0.308	0.327	0.256	0.187
Apical					
Absolute value	0.540	0.552	0.558	0.419	0.778
Considering direction	0.302	0.722	0.303	0.642	0.295
Mesio-distal deviation					
Coronal					
Absolute value	0.335	0.237	0.312	0.238	0.785
Considering direction	-0.294	0.290	0.027	0.401	0.002*
Apical					
Absolute value	0.613	0.575	0.702	0.548	0.747
Considering direction	-0.424	0.736	0.235	0.878	0.005*

- BLX implants showed statistically significant greater mesio-distal deviation at coronal and apical levels.

Conclusion

More aggressive thread geometry

may influence directional drift during Immediate Implant Placement despite comparable primary stability.