Application and biomechanics of microimplants

- **Considerations**

(biomechanical and anatomical)

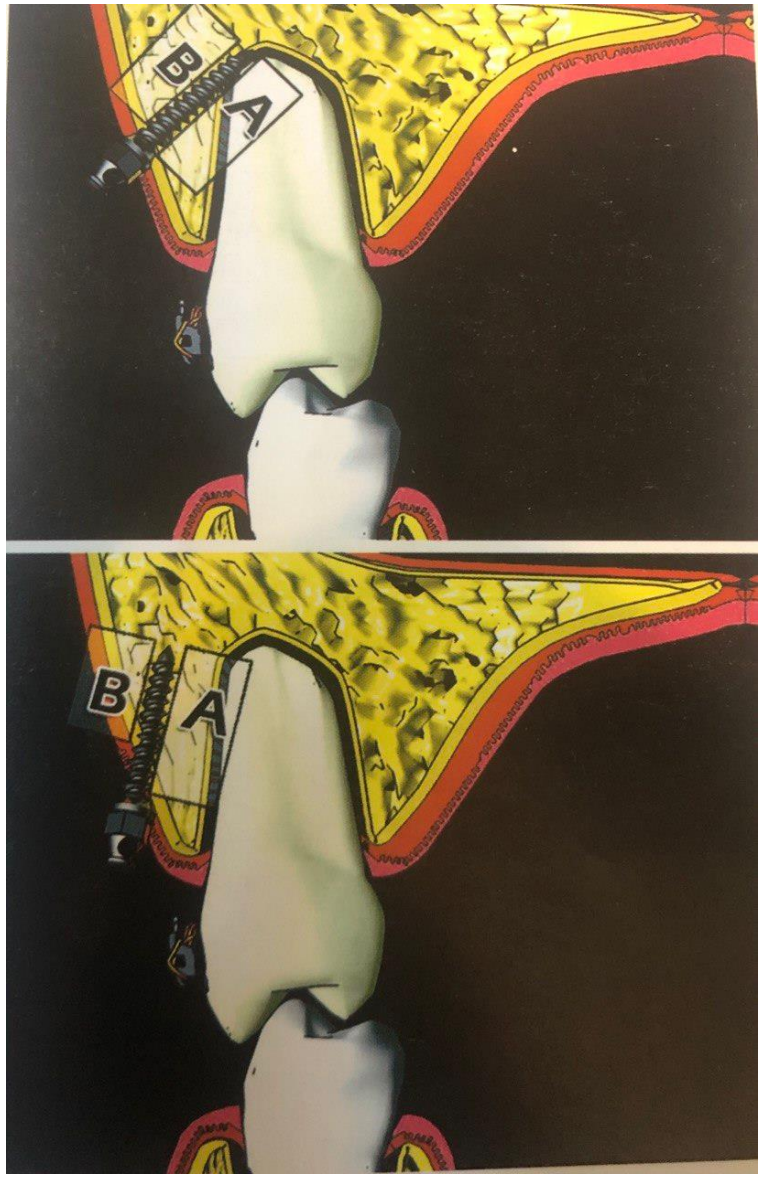
- **Location**

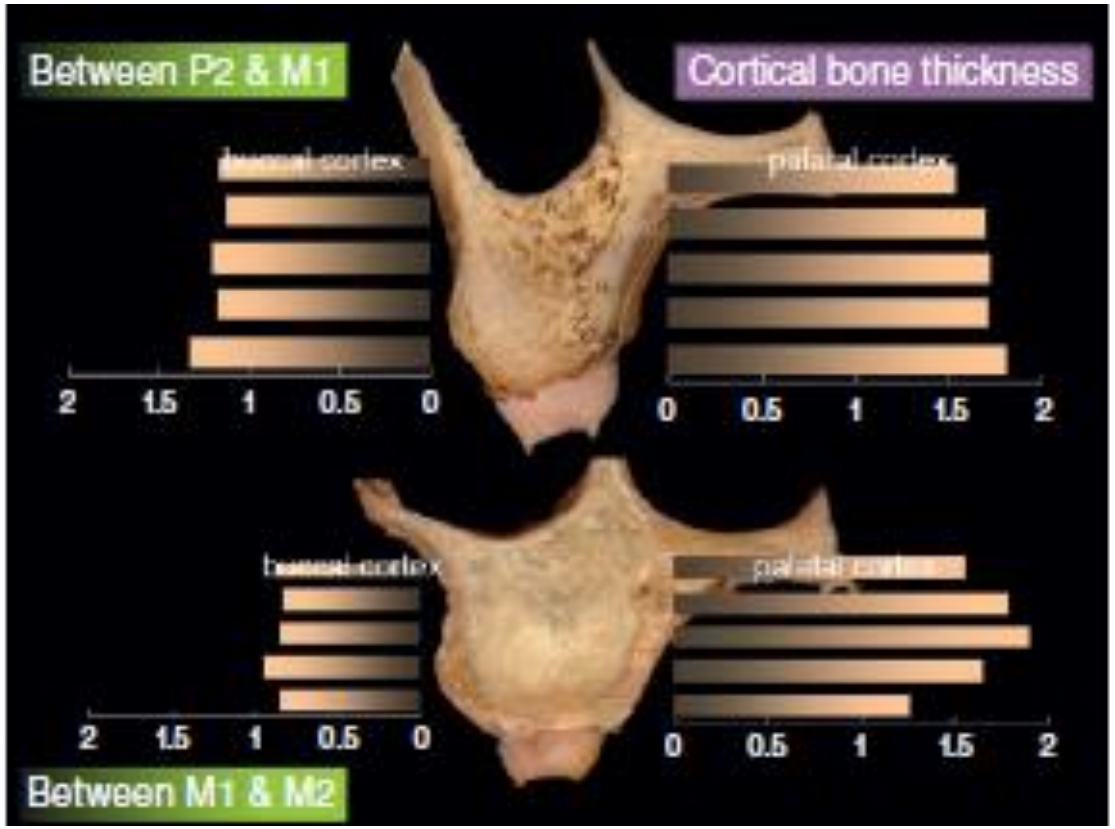
- **Implant size**

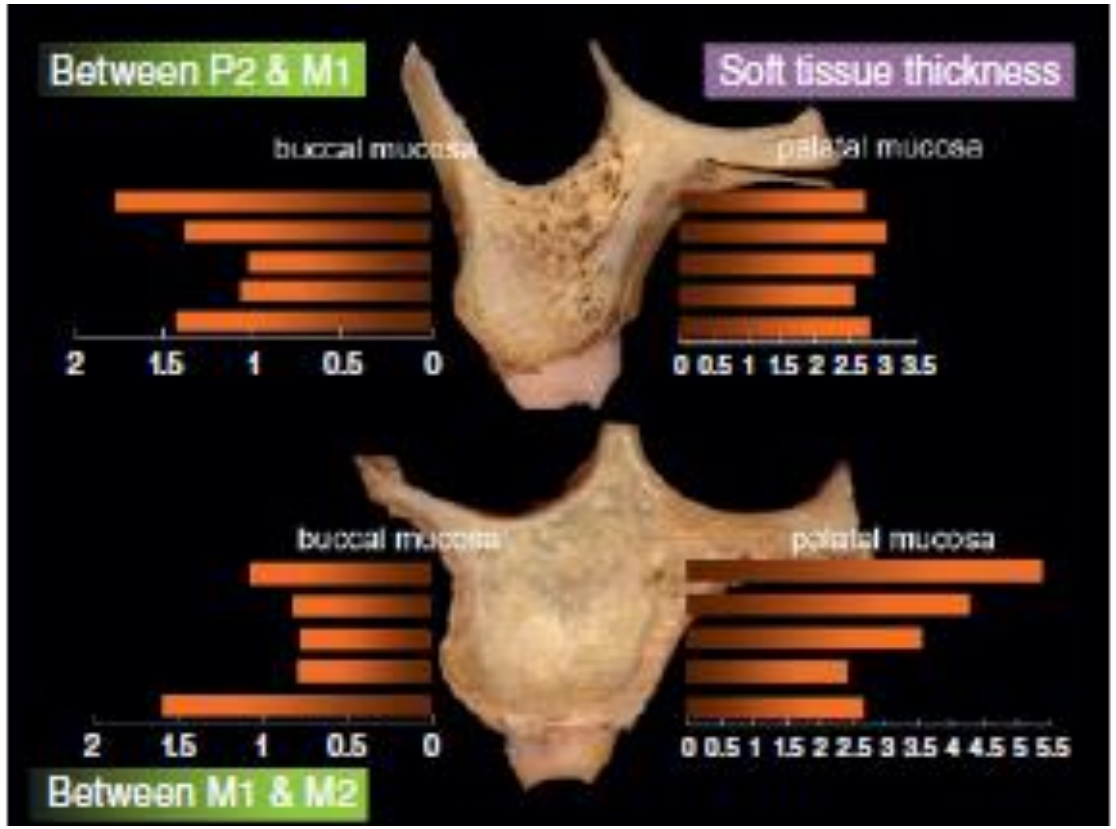
- **Implant site**

Perpendicular

Diagonal




Between P2 & M1
Cortical bone thickness
2 1.5 1 0.5 0
0 0.5 1 1.5 2
2 1.5 1 0.5 0
0 0.5 1 1.5 2
Between M1 & M2


Between P2 & M1
Soft tissue thickness
buccal mucosa
palatal mucosa
2 1.5 1 0.5 0
0 0.5 1 1.5 2 2.5 3 3.5
buccal mucosa
palatal mucosa
2 1.5 1 0.5 0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5
Between M1 & M2

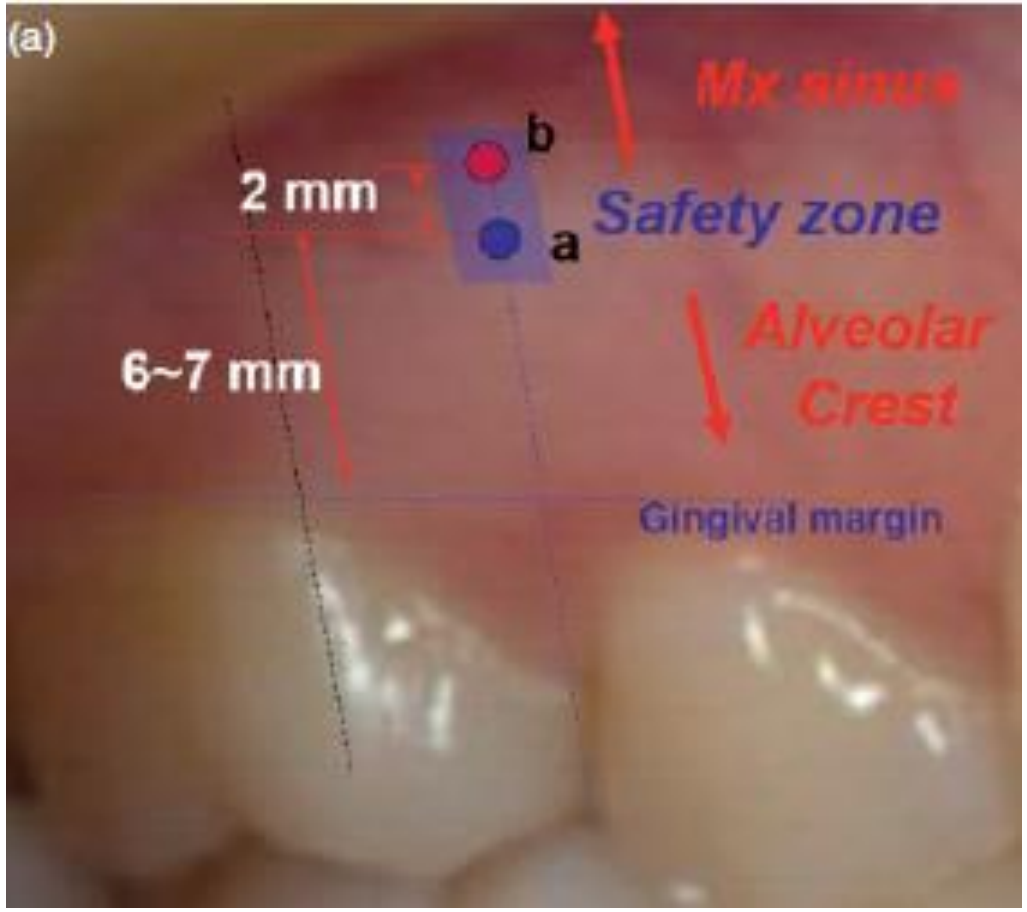
Maxilla

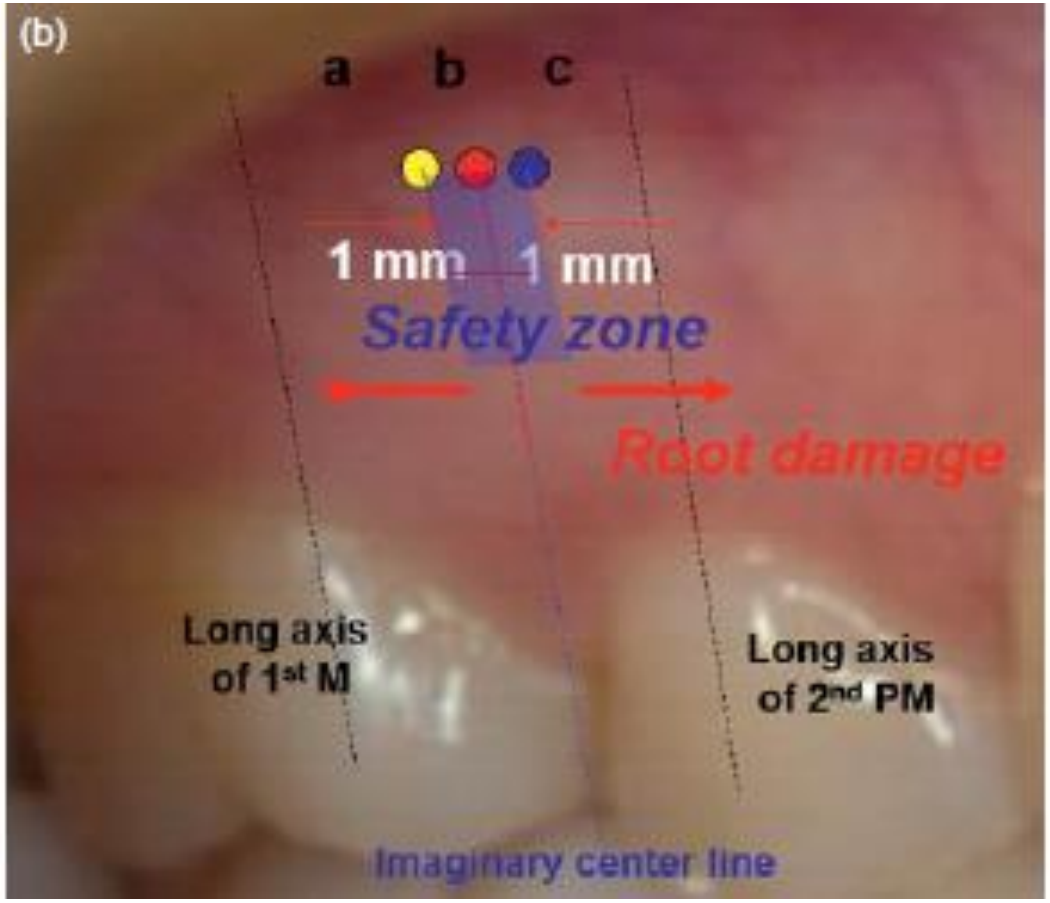
Level	2 mm		4 mm		6 mm		8 mm	
Tooth	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CI-CI	1.70	0.42	2.09	0.62	2.47	0.74	3.21	1.00
CI-LI	1.41	0.36	1.58	0.52	0.91	0.64	2.19	0.66
LI-C	2.01	0.48	2.58	0.60	2.92	0.77	3.42	1.04
C-P1	2.13	0.59	2.47	0.76	3.01	0.87	3.16	0.80
P1-P2	2.17	0.39	2.81	0.45	3.16	0.59	3.19	0.69
P2-M1	2.49	0.52	3.21	0.64	3.56	0.82	3.98	0.91
M1-M2	1.99	0.53	2.17	0.74	1.92	0.91	2.07	1.13

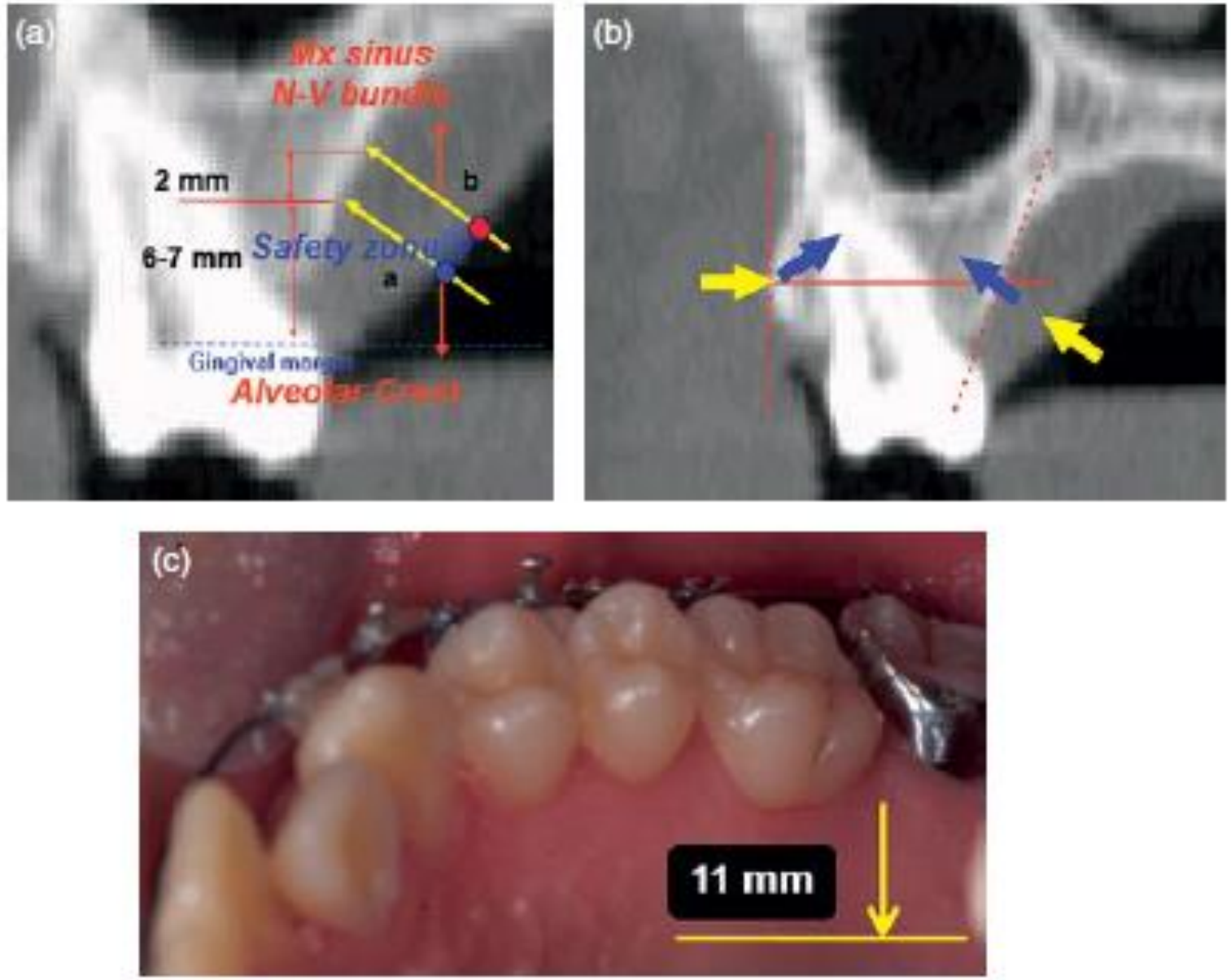
CI, Central incisor; LI, lateral incisor; C, canine; P1, first premolar; P2, second premolar; M1, first molar; M2, second molar.

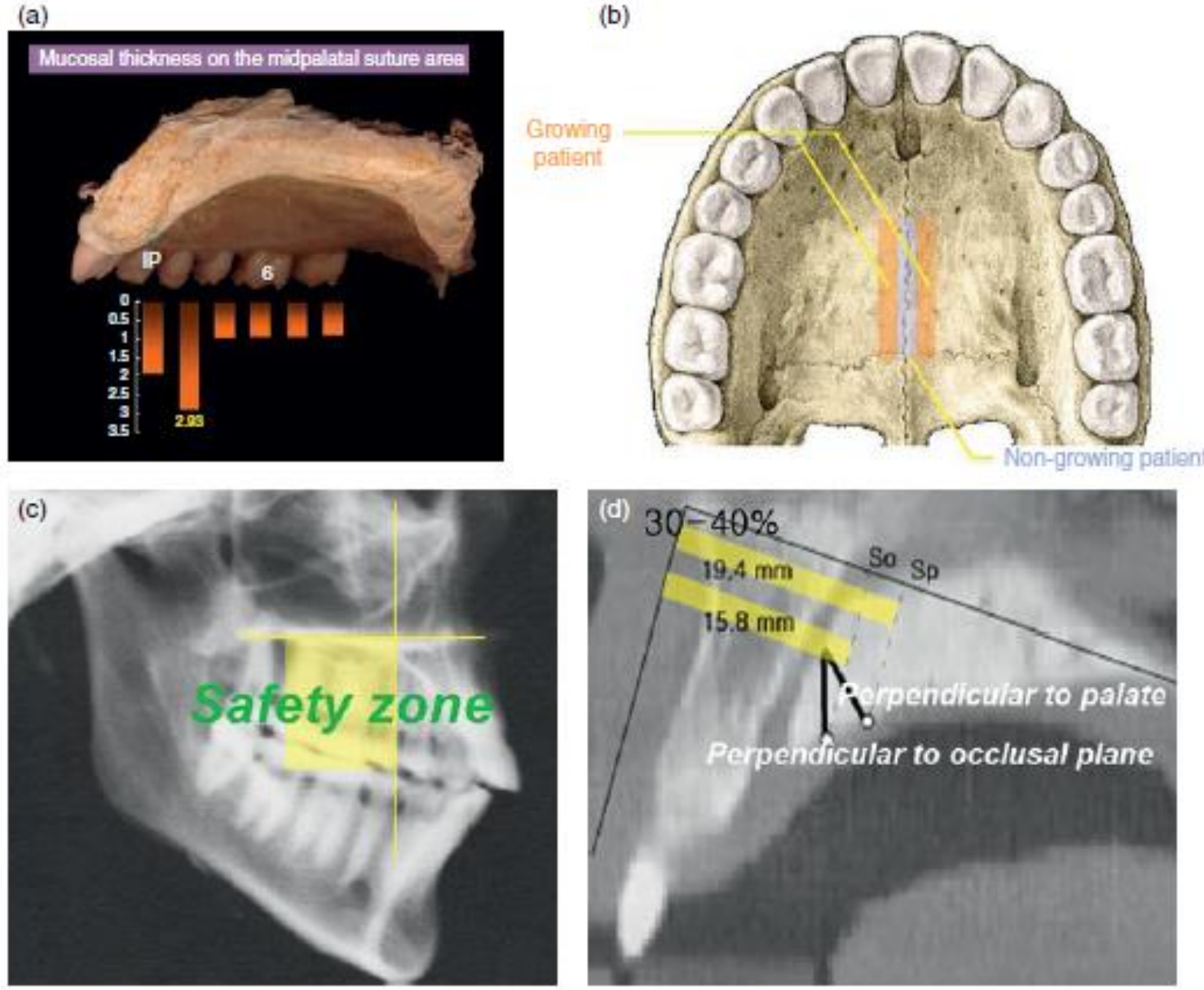
Level	2 mm		4 mm		6 mm		8 mm	
Tooth	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CI	0.00	0.00	0.02	0.09	0.76	0.53	0.52	0.54
LI	0.00	0.00	0.04	0.19	0.48	0.59	0.27	0.48
C	0.00	0.00	0.10	0.29	1.46	0.47	0.43	0.50
P1	0.09	0.28	0.50	0.69	0.72	0.58	0.70	0.70
P2	0.48	0.76	0.52	1.01	1.80	0.84	1.76	0.92
M1 mesial	0.13	0.06	1.25	0.85	1.60	0.90	1.49	0.92
M1 distal	0.30	0.67	1.79	0.92	2.32	1.03	2.40	1.32
M2 mesial	0.14	0.45	1.53	1.01	2.75	0.85	3.27	0.85
M2 distal	0.12	0.06	1.38	0.96	2.58	0.87	2.92	0.95

CI, Central incisor; LI, lateral incisor; C, canine; P1, first premolar; P2, second premolar; M1, first molar; M2, second molar.


(a)
Mx sinus
b
2 mm
a
Safety zone
Alveolar
Crest
6~7 mm
Gingival margin


(b)
a b c
1 mm 1 mm
Safety zone
Root damage
Long axis
of 1st M
Long axis
of 2nd PM
Imaginary center line


(a)
Mx sinus
N-V bundle
2 mm
b
6-7 mm
Safety zone
a
Gingival margin
Alveolar Crest
(b)
(c)
11 mm


(a)
Mucosal thickness on the midpalatal suture area
IP
6
0
0.5
1
1.5
2
2.5
3
3.5
2.93
(b)
Growing patient
Non-growing patient
(c)
Safety zone
(d)
30–40%
19.4 mm
15.8 mm
So
Sp
Perpendicular to palate
Perpendicular to occlusal plane

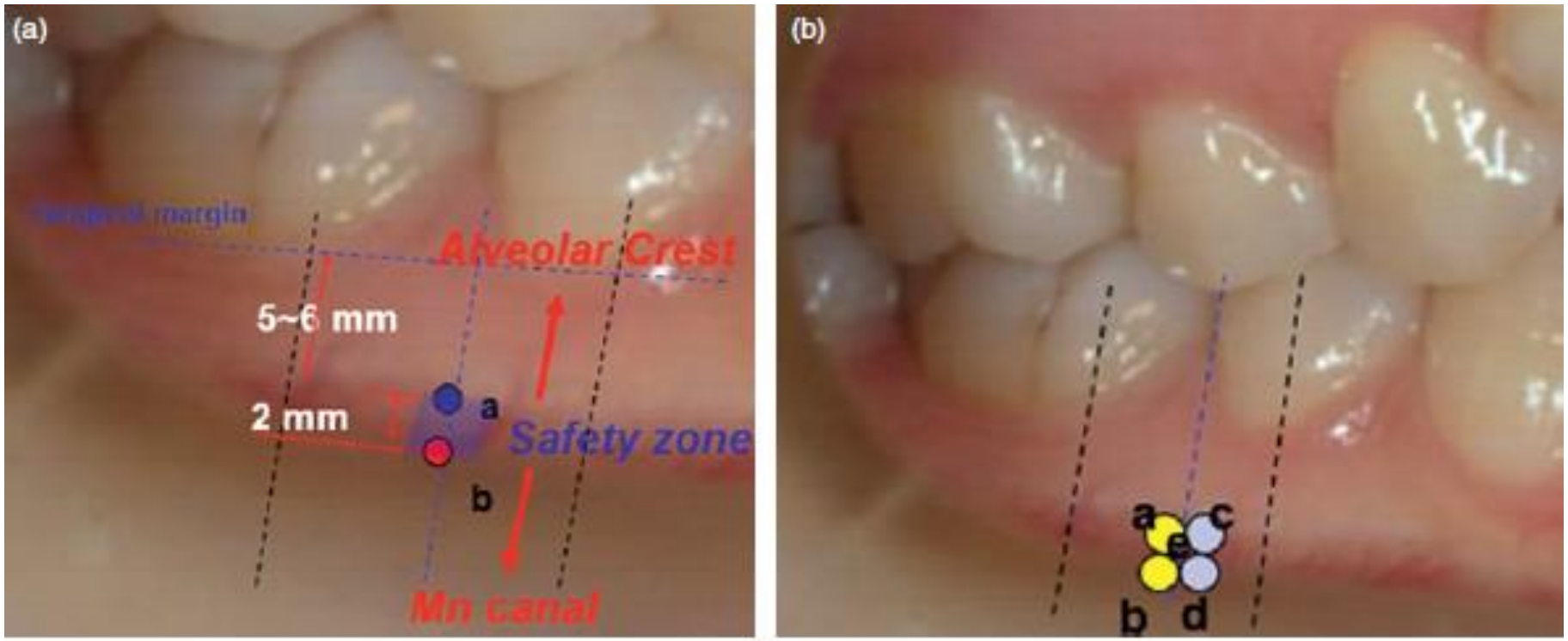
Mandible

Level	2 mm		4 mm		6 mm		8 mm	
Tooth	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CI-CI	1.31	0.37	1.38	0.36	1.57	0.46	1.80	0.54
CI-LI	1.09	0.29	1.17	0.32	1.22	0.35	1.22	0.32
LI-C	1.39	0.50	1.68	0.46	1.88	0.59	2.03	0.66
C-P1	1.91	0.55	2.40	0.06	2.76	0.76	2.86	0.82
P1-P2	2.53	0.51	3.36	0.59	3.95	0.70	4.10	0.78
P2-M1	2.61	0.58	3.31	0.65	3.57	0.78	3.96	0.81
M1-M2	2.75	0.59	3.25	0.88	3.52	1.13	4.02	1.39

CI, Central incisor; LI, lateral incisor; C, canine; P1, first premolar; P2, second premolar; M1, first molar; M2, second molar.

Level	2 mm		4 mm		6 mm		8 mm	
Tooth	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CI	0.06	0.24	0.21	0.38	0.38	0.47	0.10	0.28
LI	0.00	0.00	0.20	0.34	0.31	0.40	0.06	0.23
C	0.00	0.00	0.19	0.41	0.14	0.33	0.04	0.13
P1	0.07	0.28	0.12	0.29	0.14	0.27	0.27	0.46
P2	0.38	0.79	0.70	0.73	0.86	0.85	1.17	1.02
M1 mesial	0.47	0.71	0.83	0.98	1.08	1.11	0.65	1.72
M1 distal	0.50	0.65	1.09	0.89	1.77	1.25	2.58	1.51
M2 mesial	1.16	1.27	2.83	1.77	4.47	1.88	6.26	1.80
M2 distal	2.44	1.51	4.23	1.72	5.72	2.08	7.26	2.05

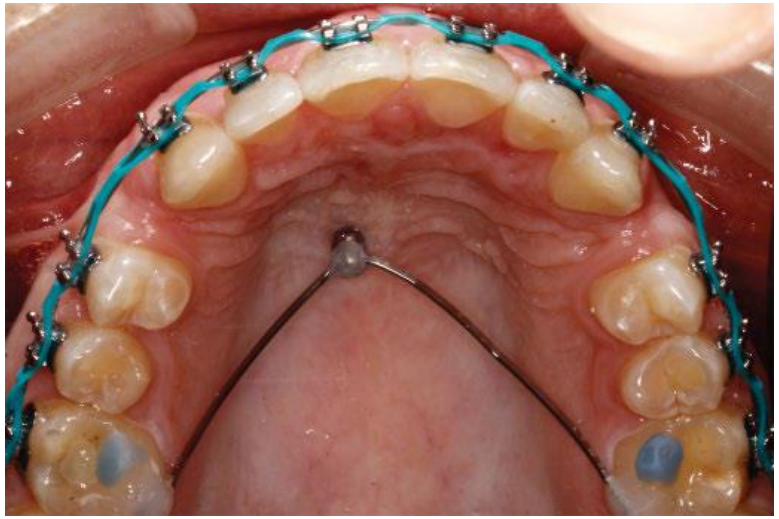
CI, Central incisor; LI, lateral incisor; C, canine; P1, first premolar; P2, second premolar; M1, first molar; M2, second molar.

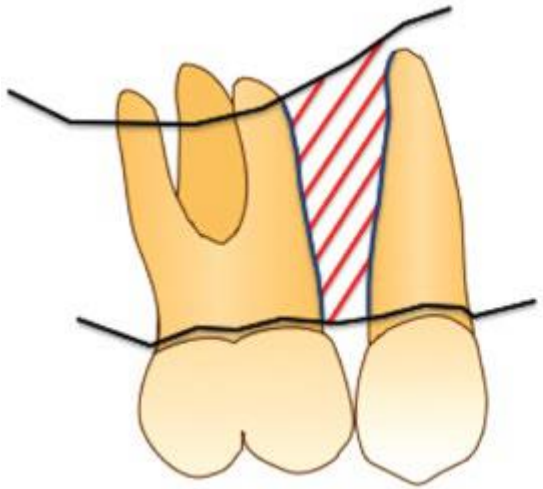

(a)
Gingival margin
Alveolar Crest
5~6 mm
2 mm
a
b
Safety zone
Mn canal
(b)
a
c
e
b
d

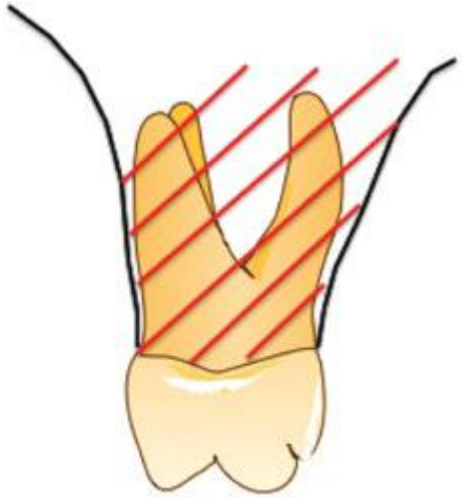
Implant site selection

Indication driven approach

Anatomy driven approach

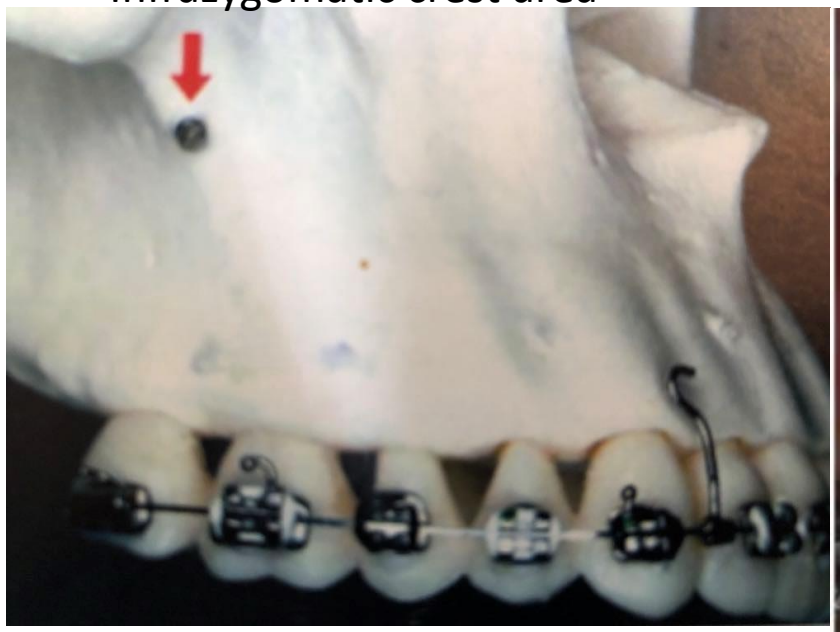


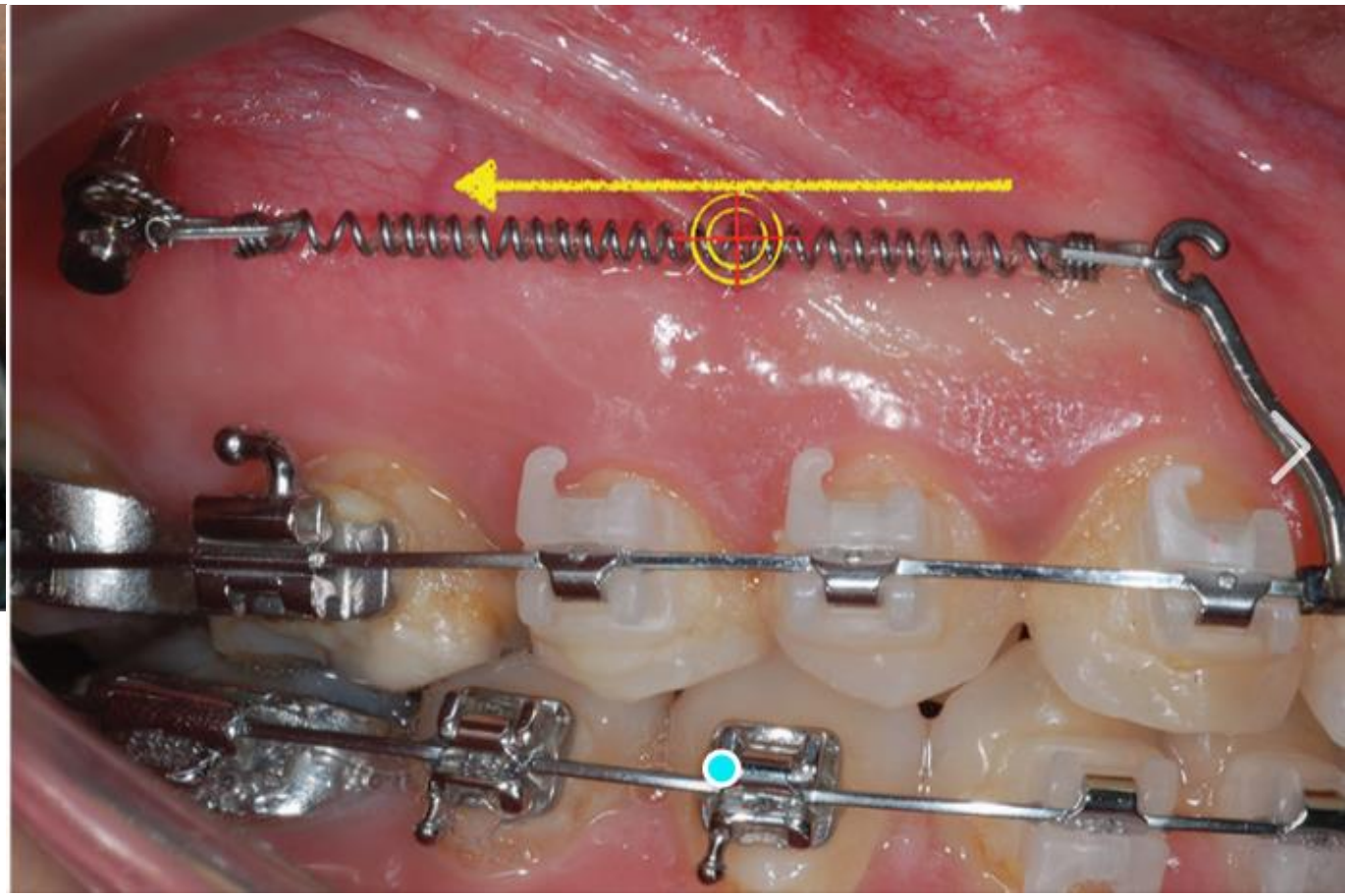




Implant sites

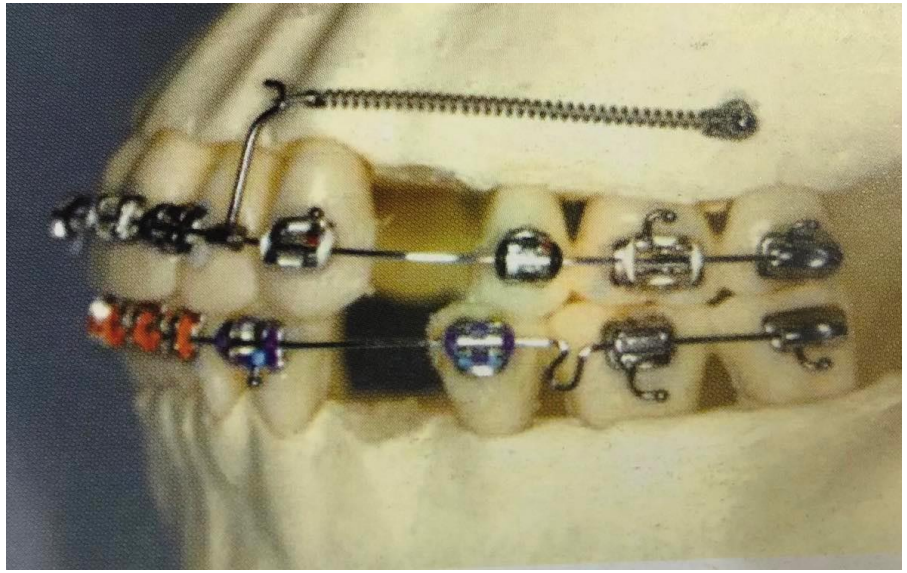
Infrazygomatic crest area



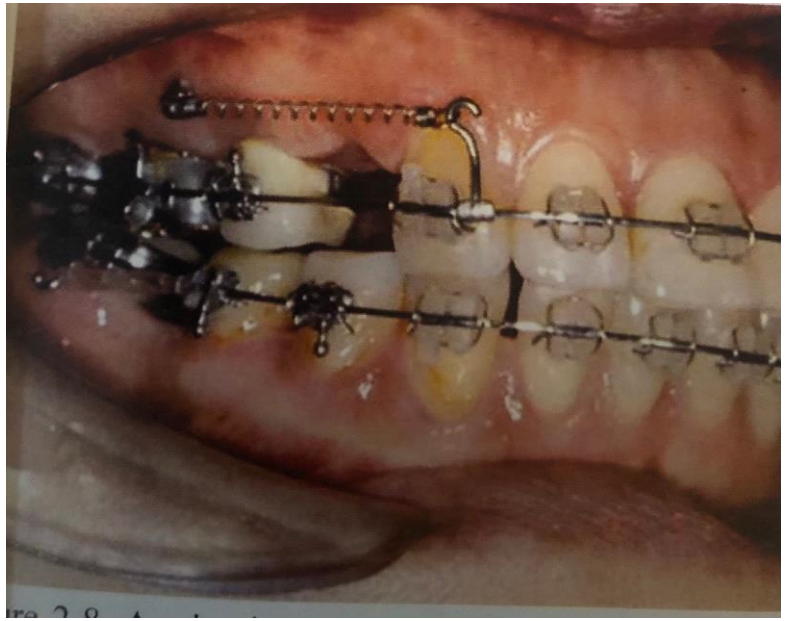


Maxillary tuberosity area

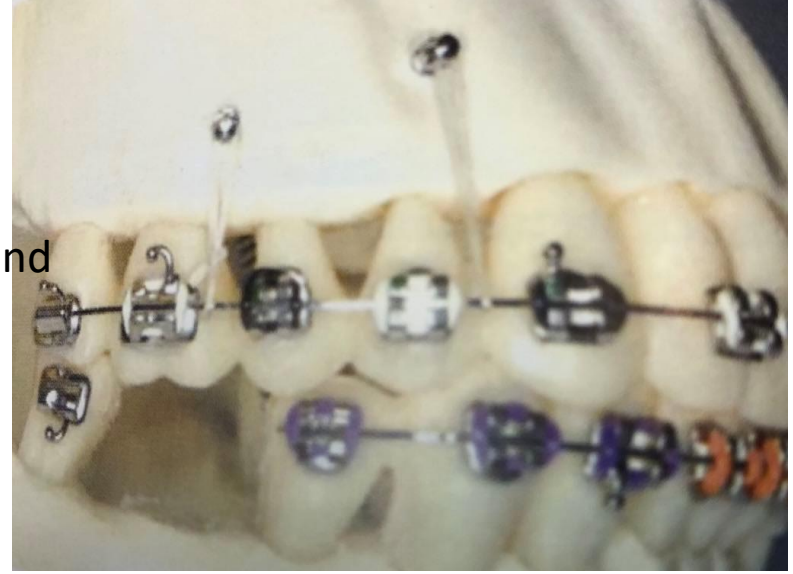
Between first and second molars buccally



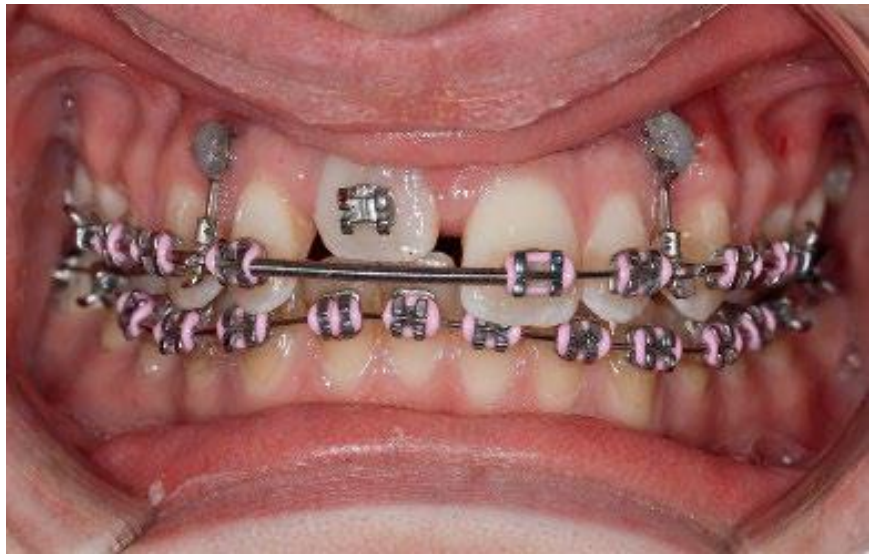
Between first and second molars buccally



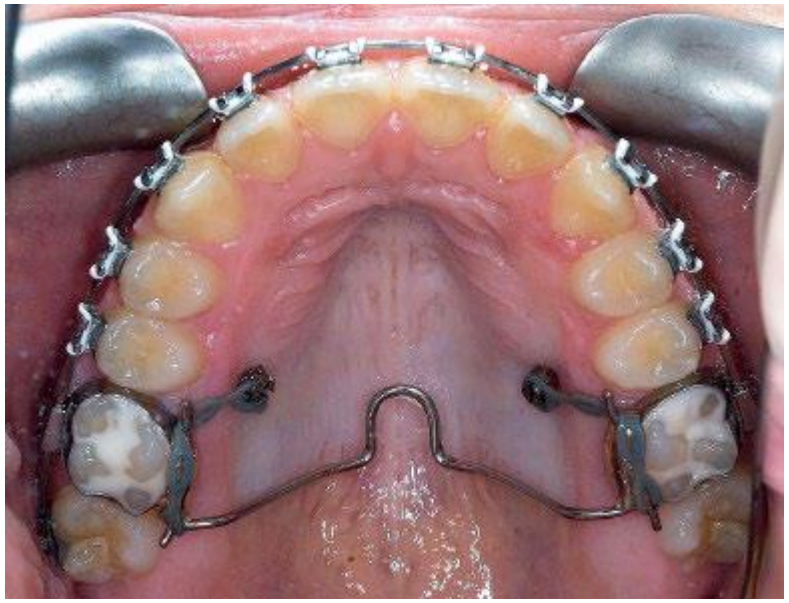
Between the maxillary canine and first premolar buccally



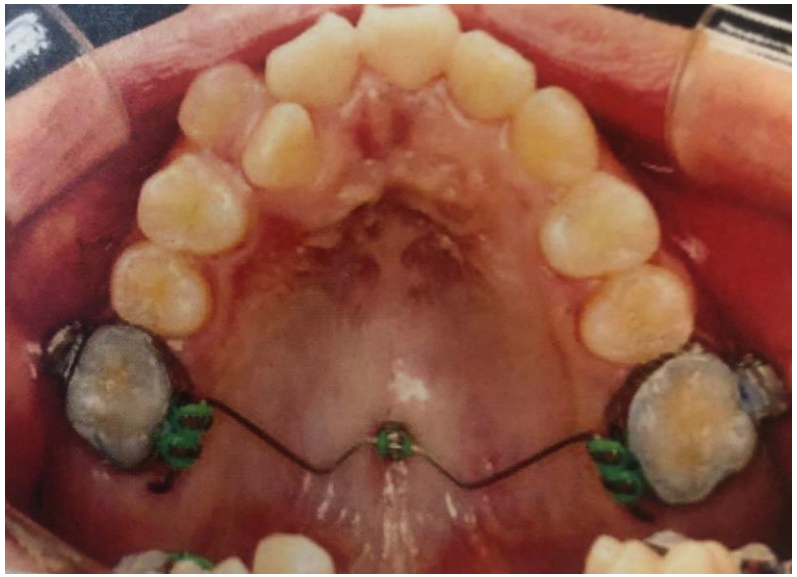
Between incisors facially

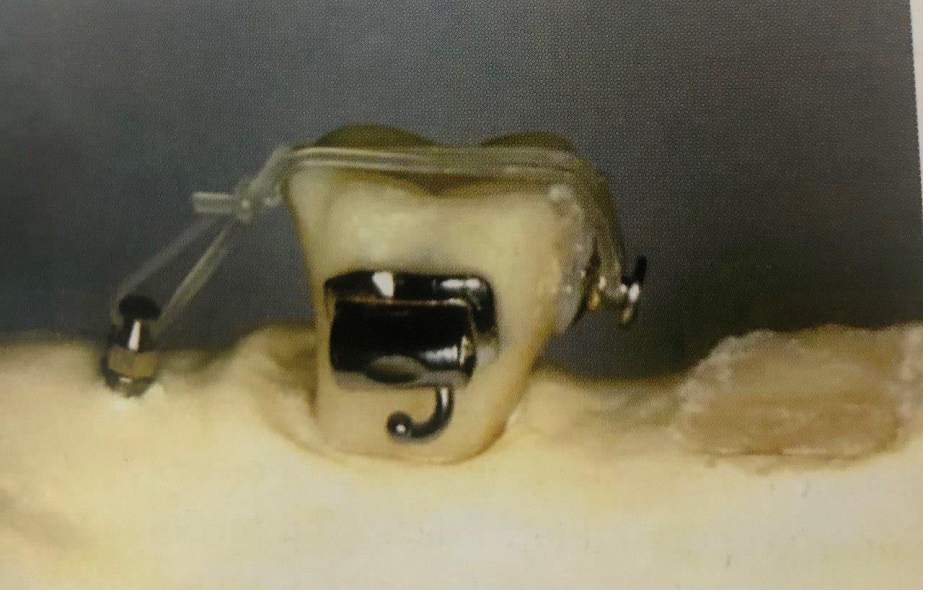


Between second premolar and first molar and between first and second molars palatally.



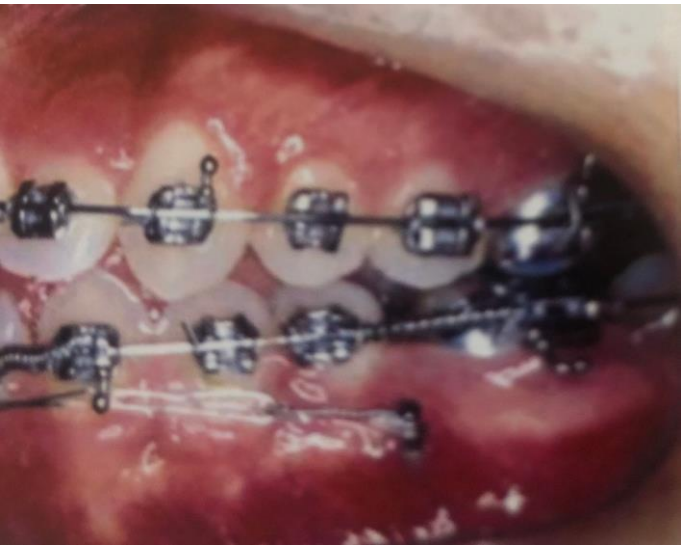
Midpalatal area



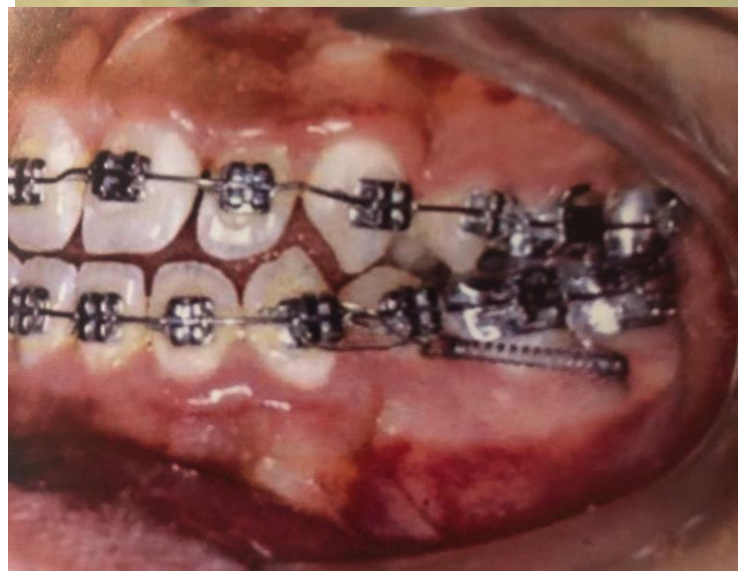


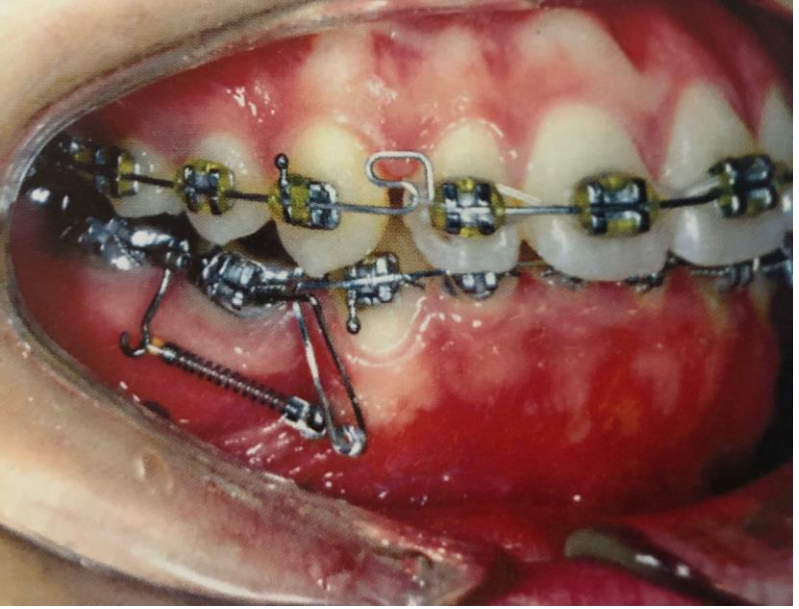
Retromolar area

Between first and second molar buccally



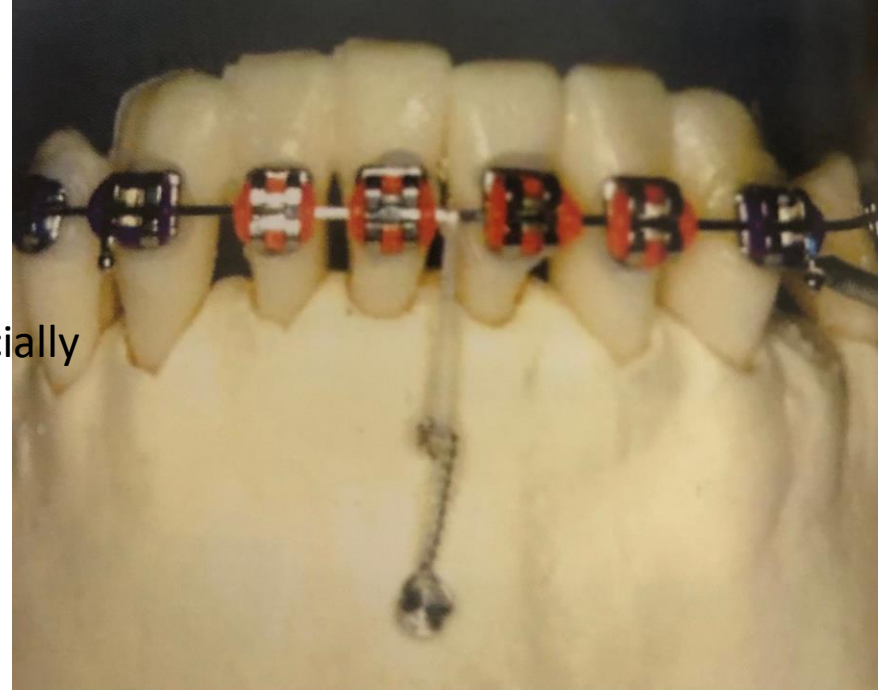
Between second premolar and first molar buccally





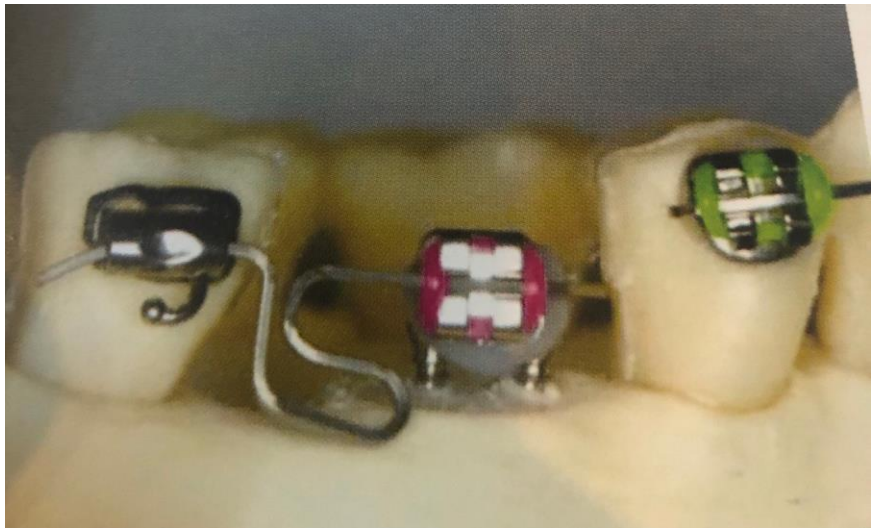
Between canine and first premolar

Mandibular symphysis facially



Lingual site

Edentulous area

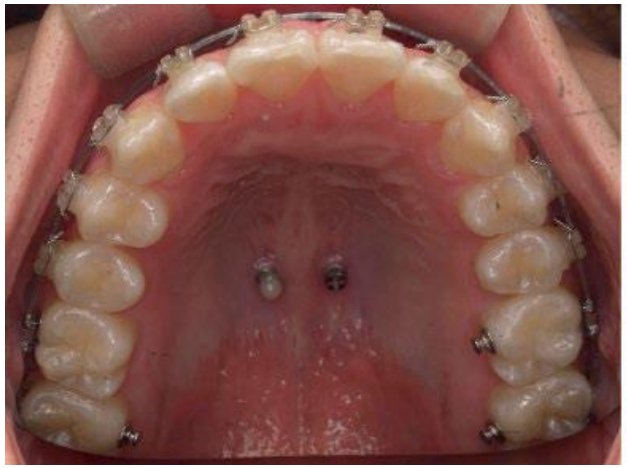


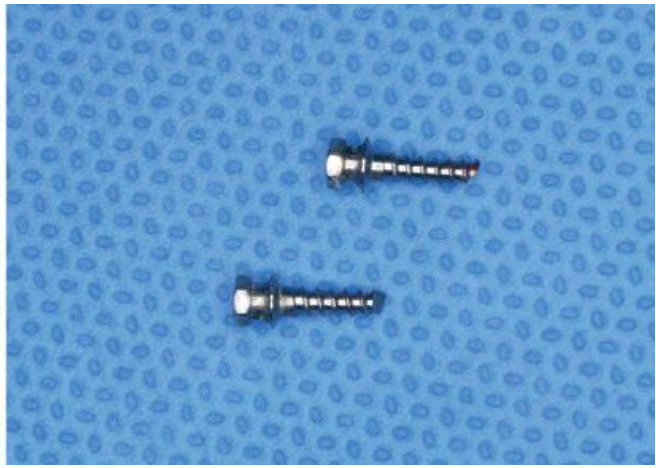
Implant failure

Factors:

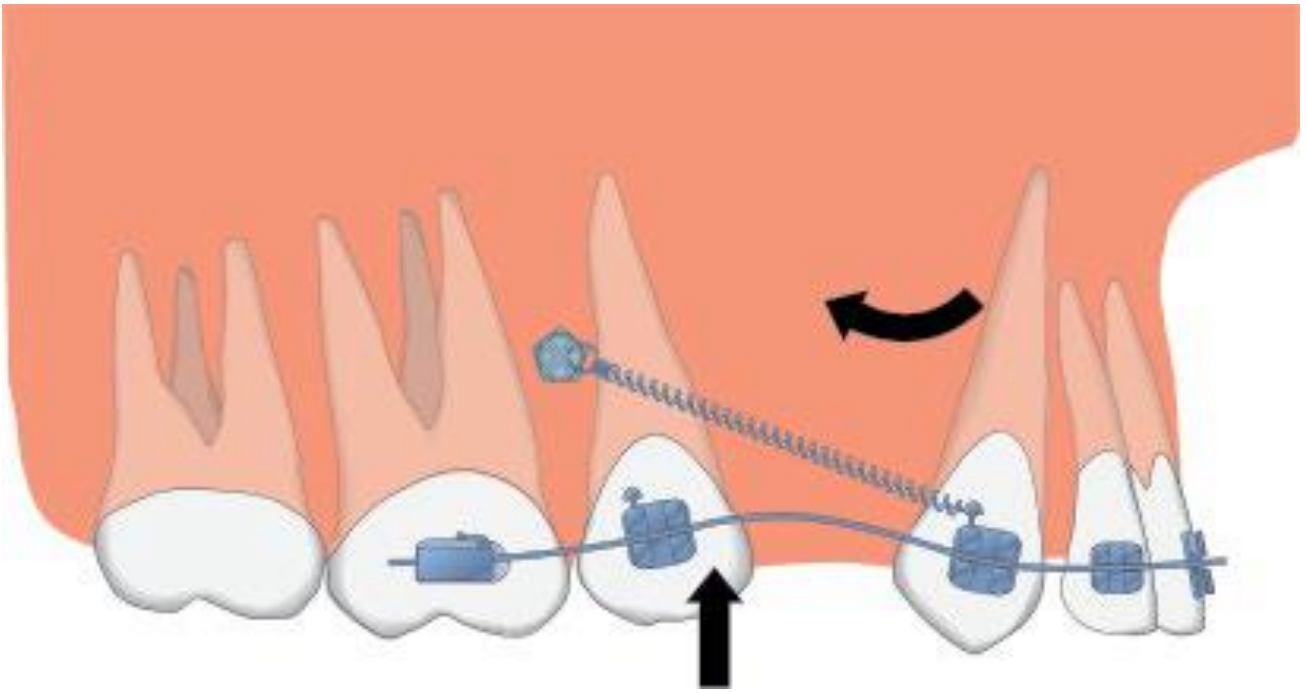
Iatrogenic factors: heat, root injury, initial stability, contamination, negligence, impingement, nerve and artery injury, fracture.

Host factors: systemic disease, bone quality, amount of attached gingiva, age, oral conditions.

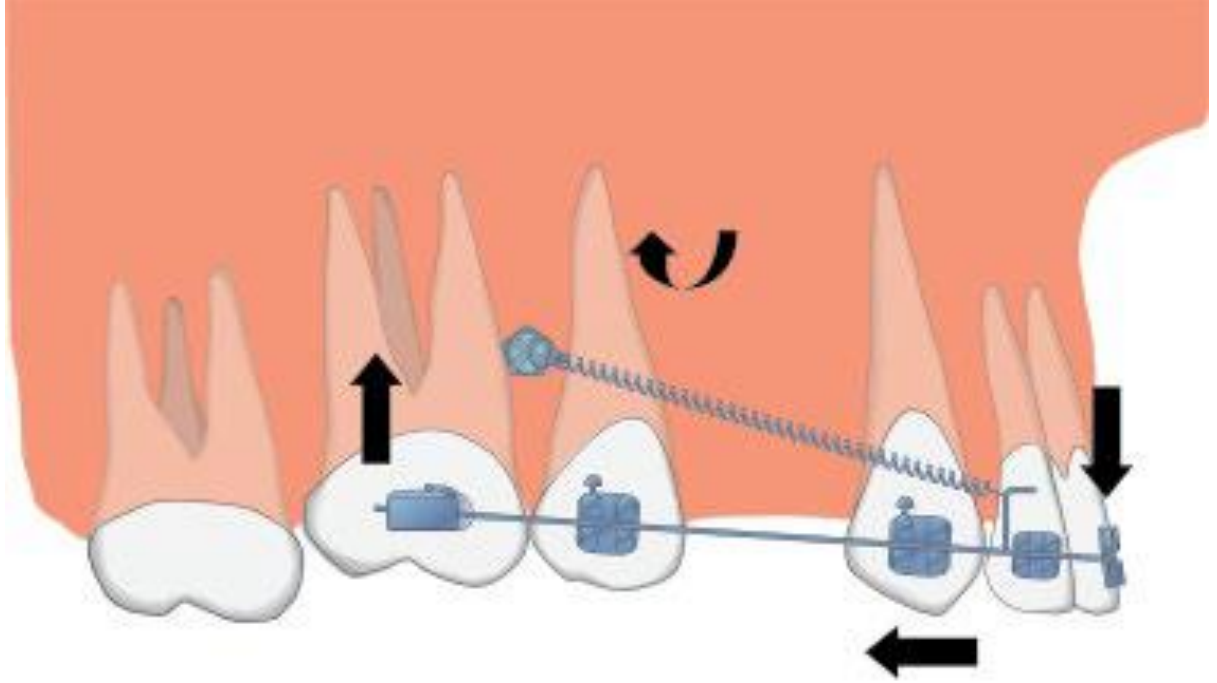




Anterior retraction



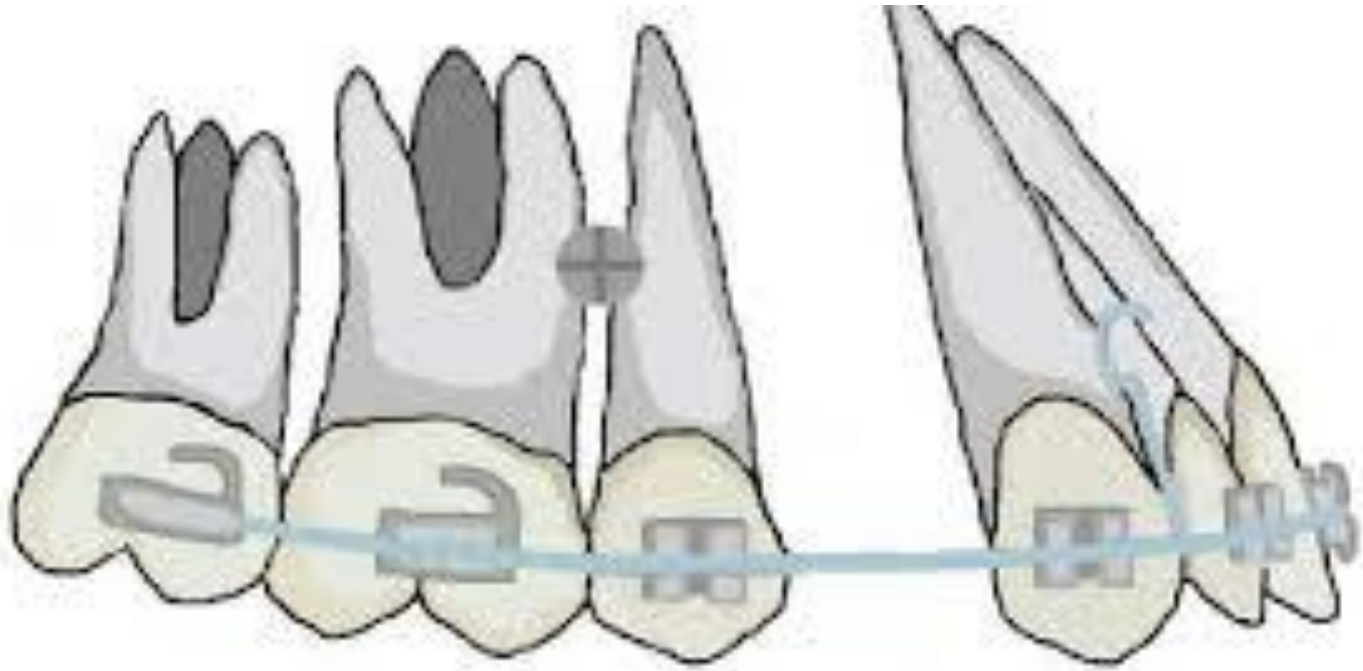
(a) Flexible archwire

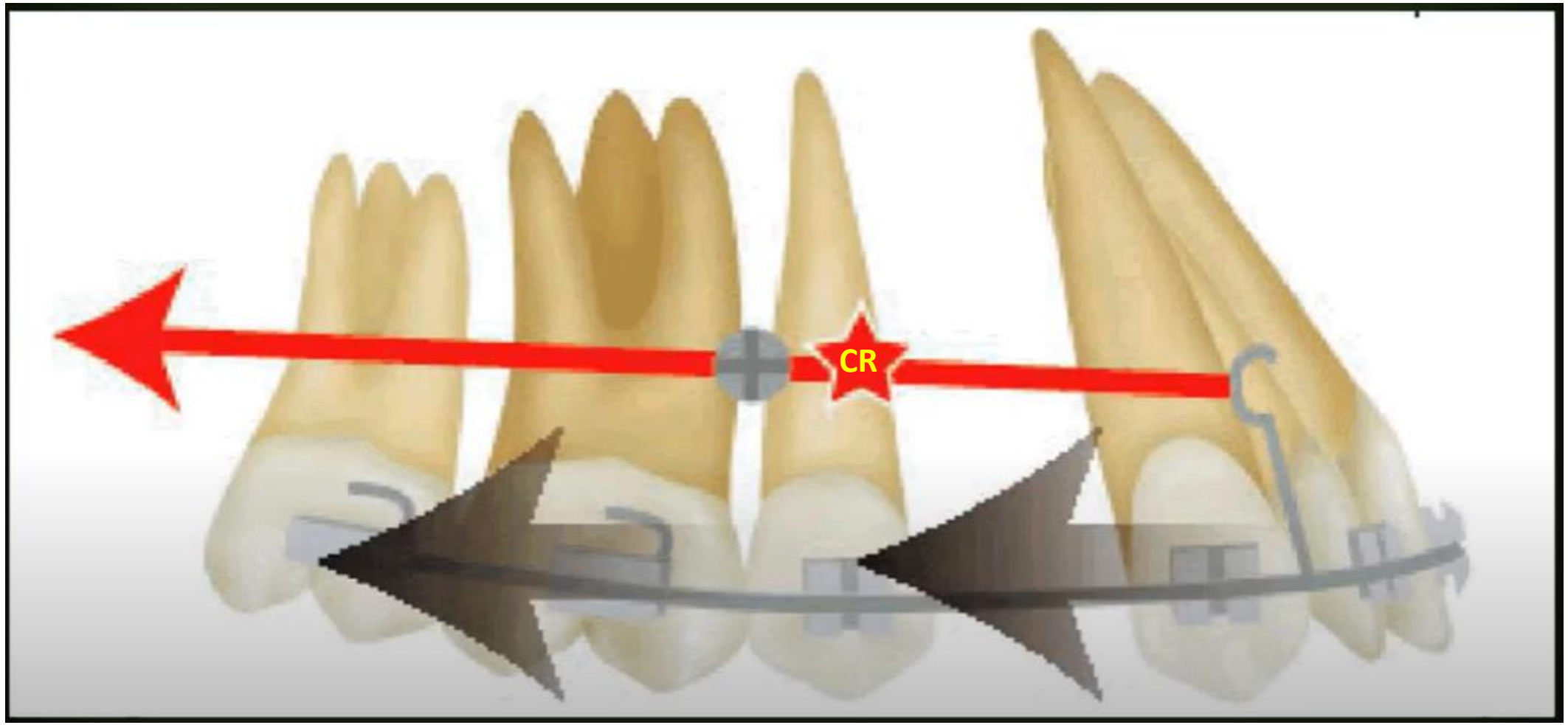


(b) rigid archwire

(a) Flexible archwire: Distal tipping of the canine and a rollercoaster bowing of the archwire occur in scenario.

(b) rigid archwire: predominantly molar intrusion occurs.

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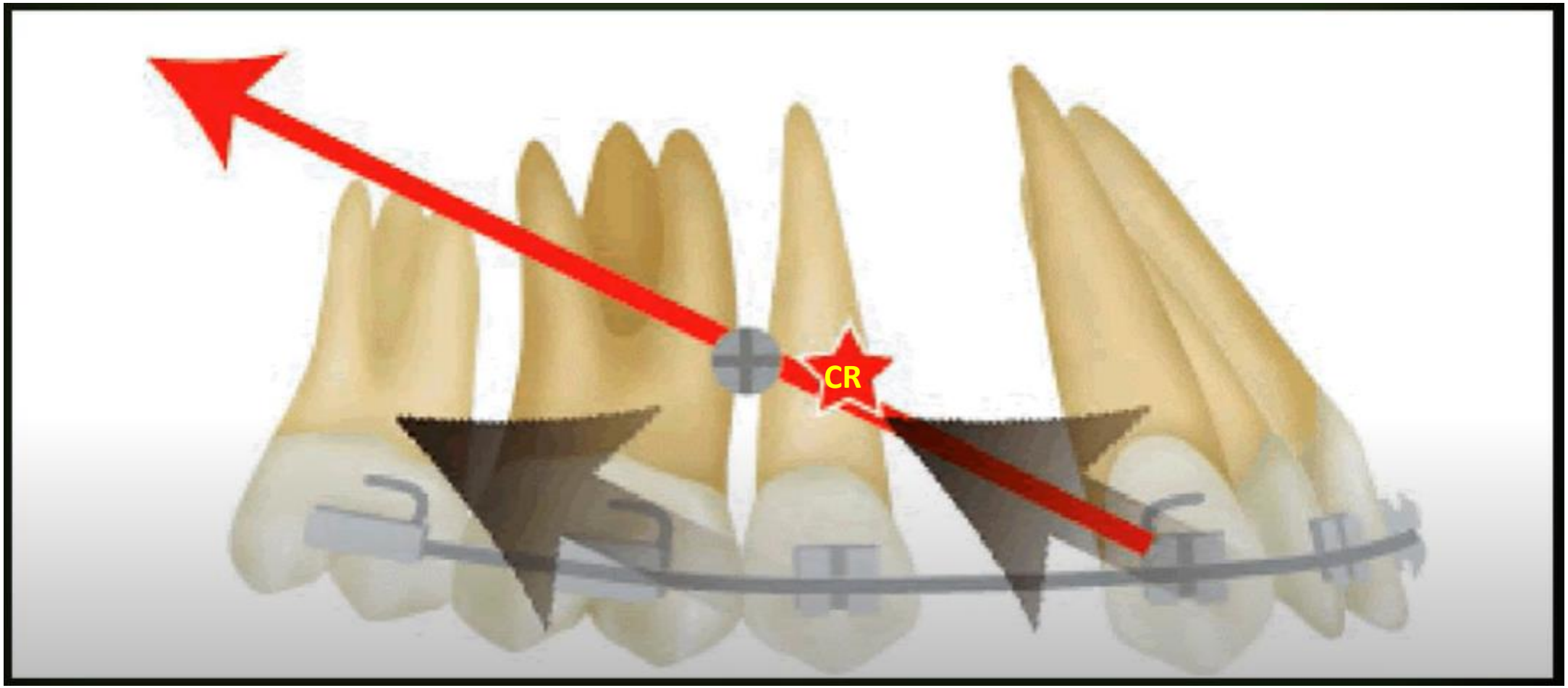
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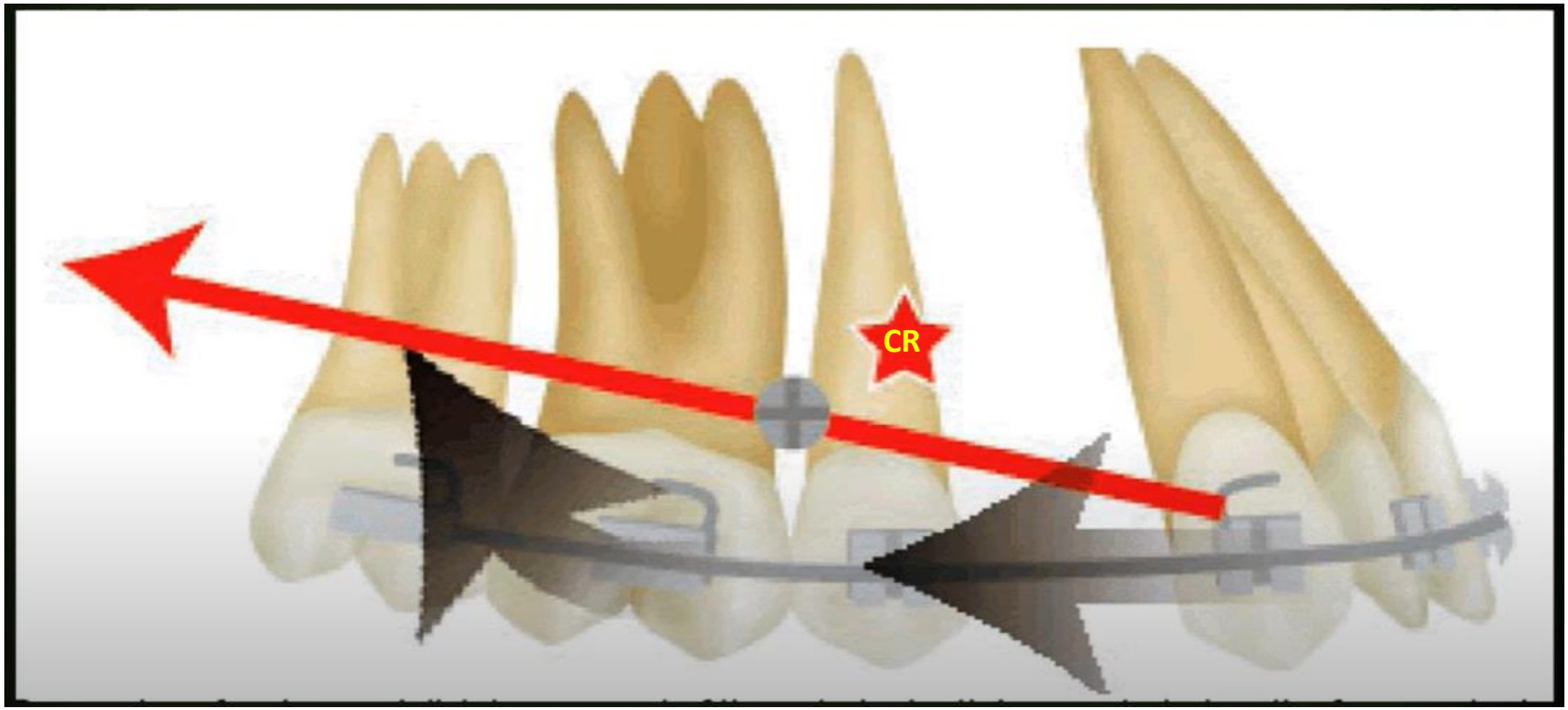
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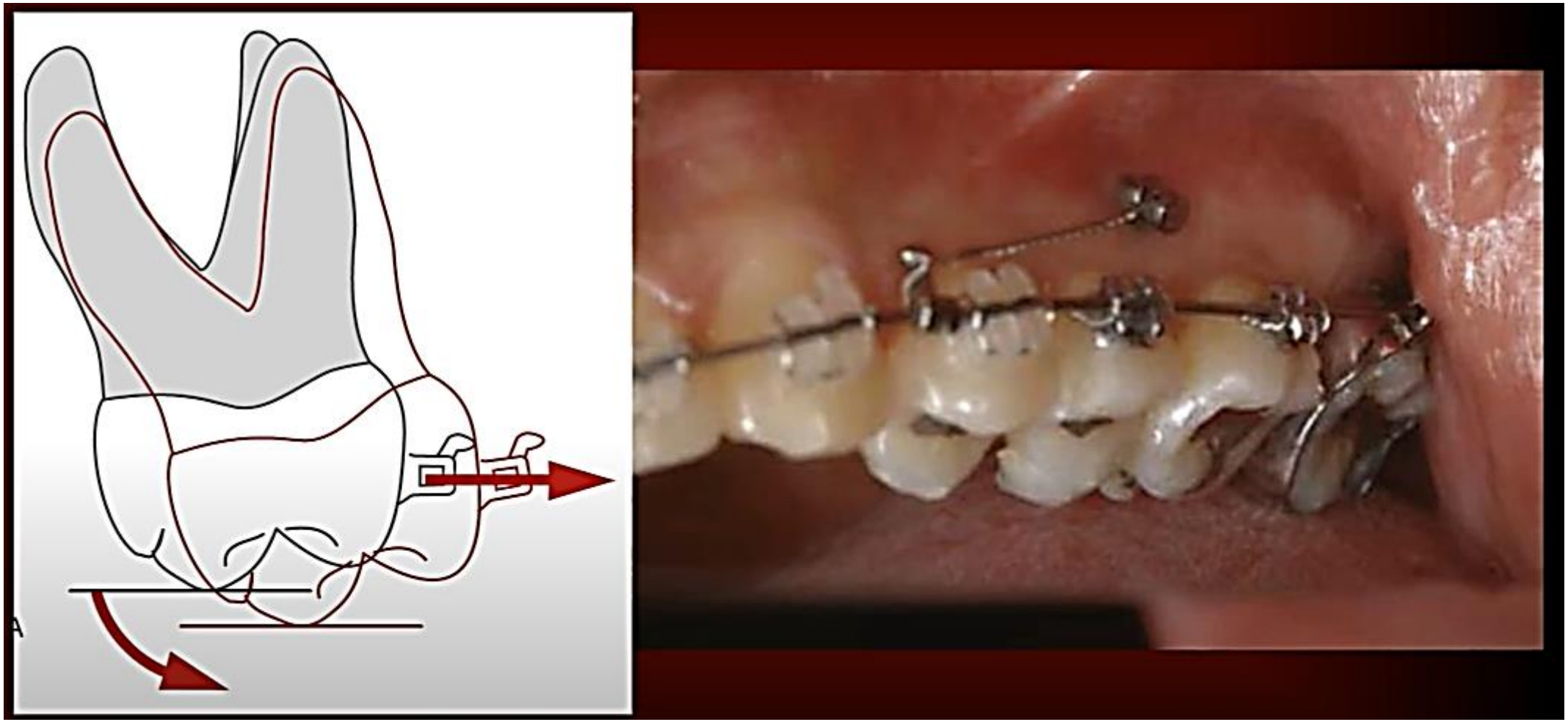
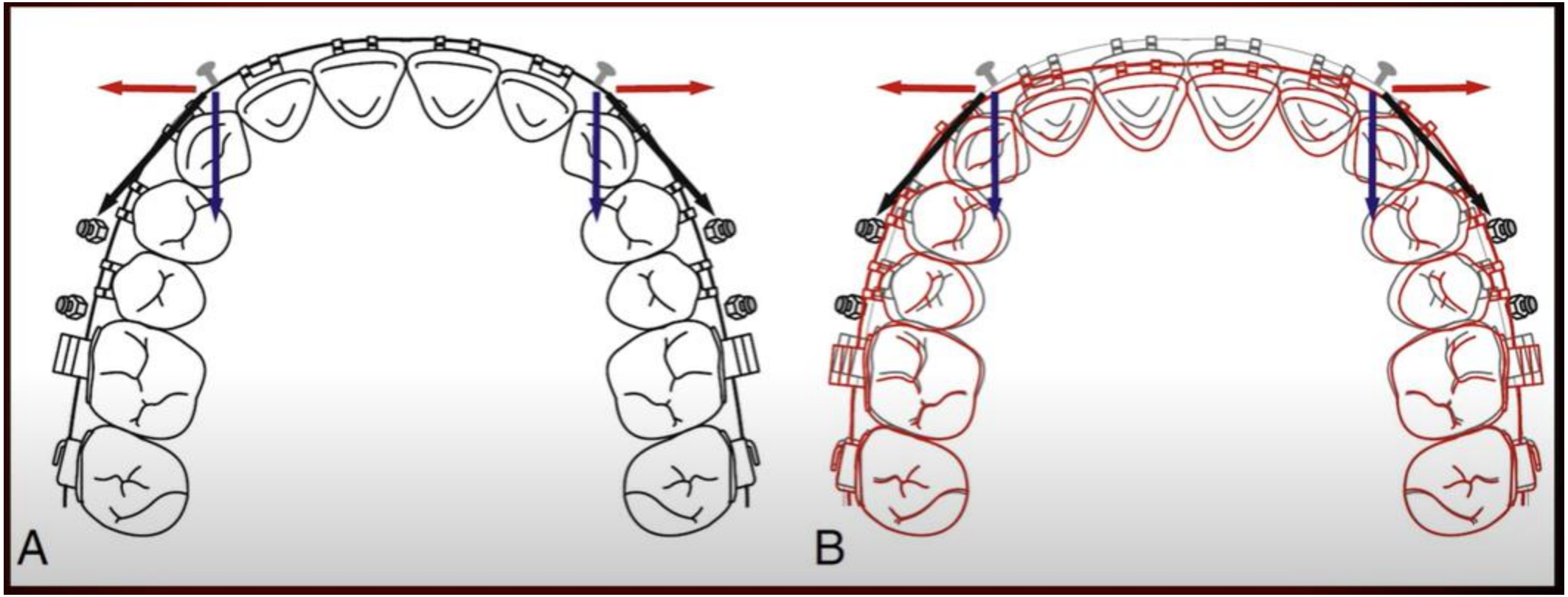
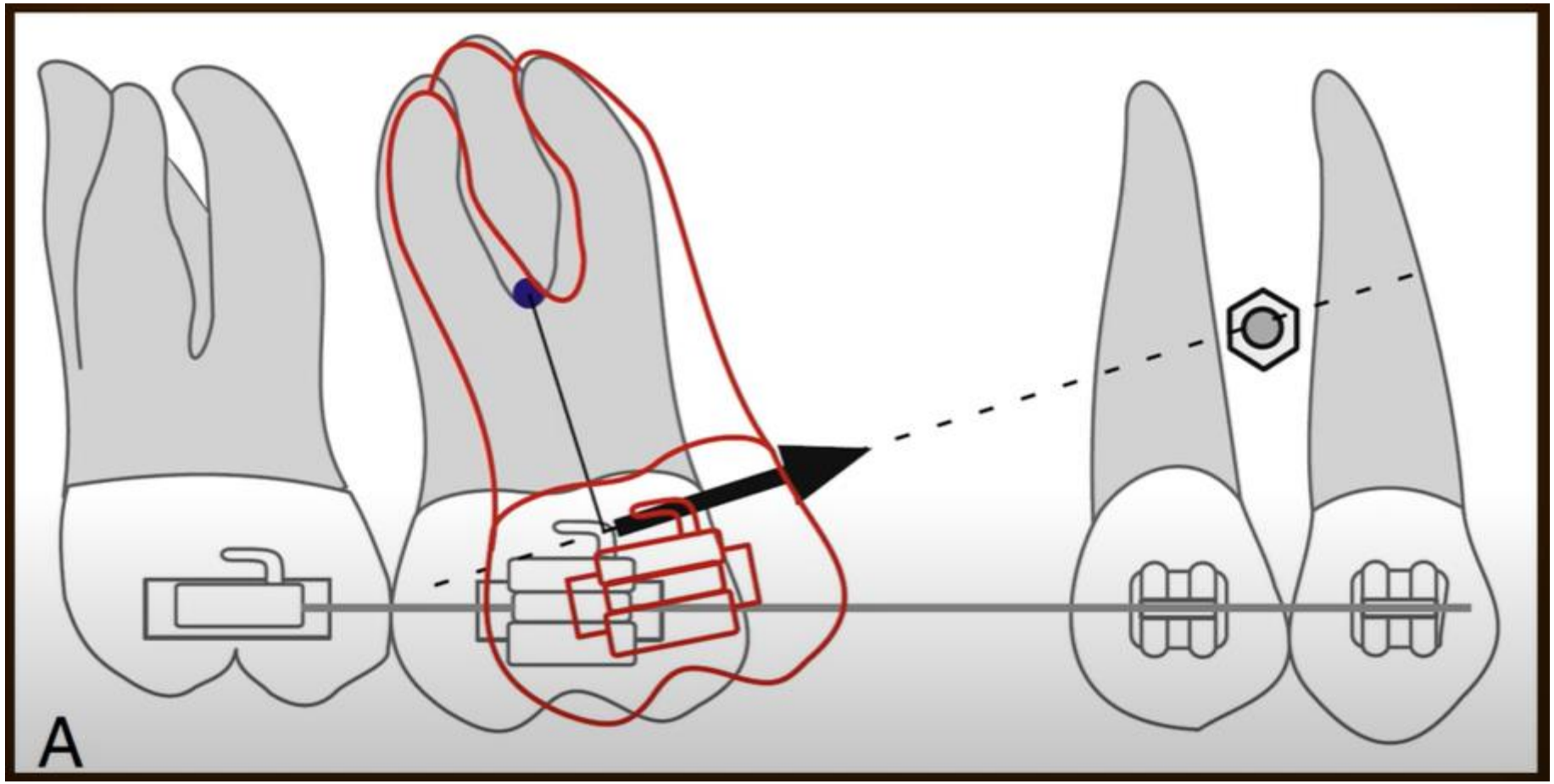
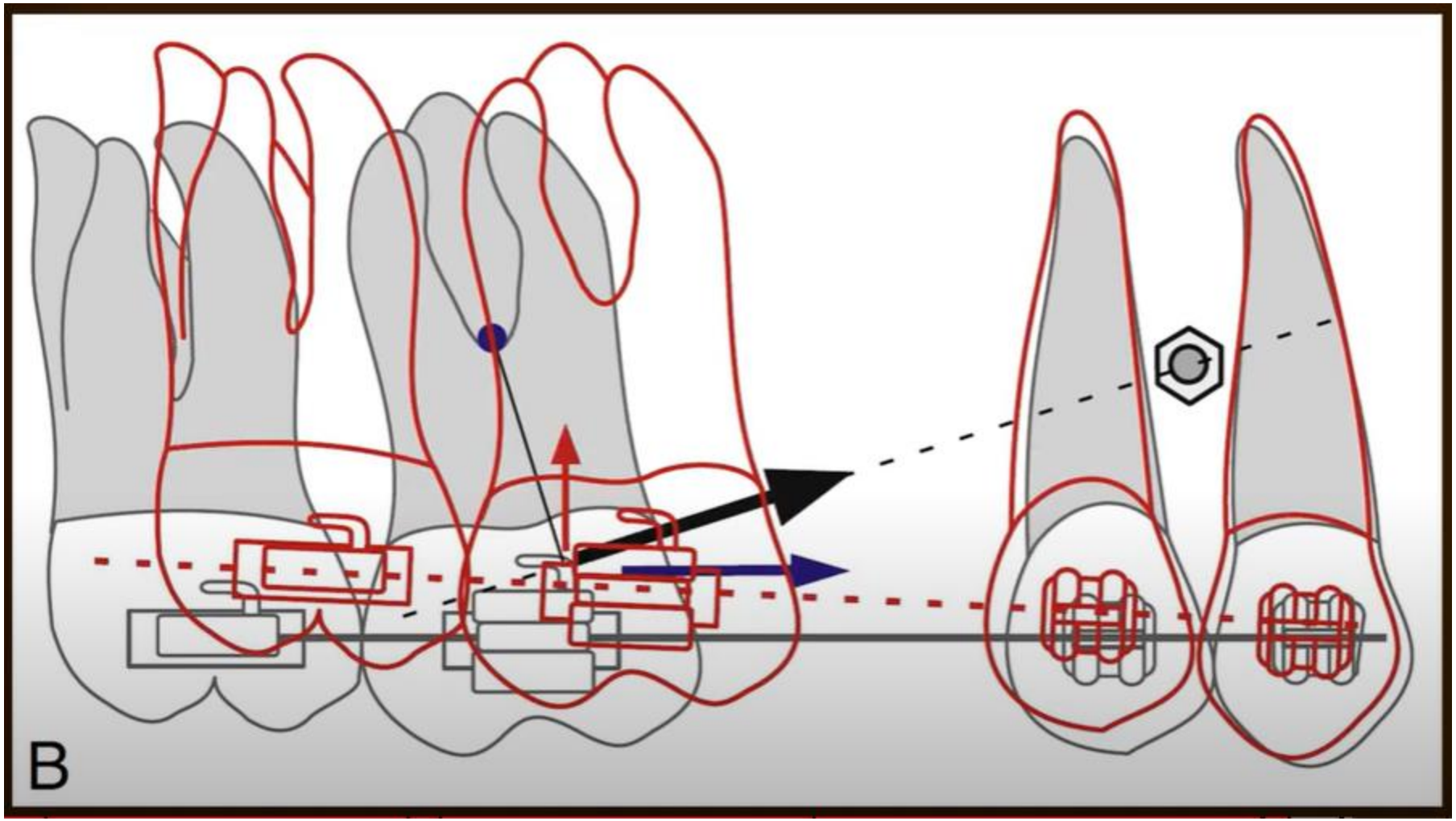
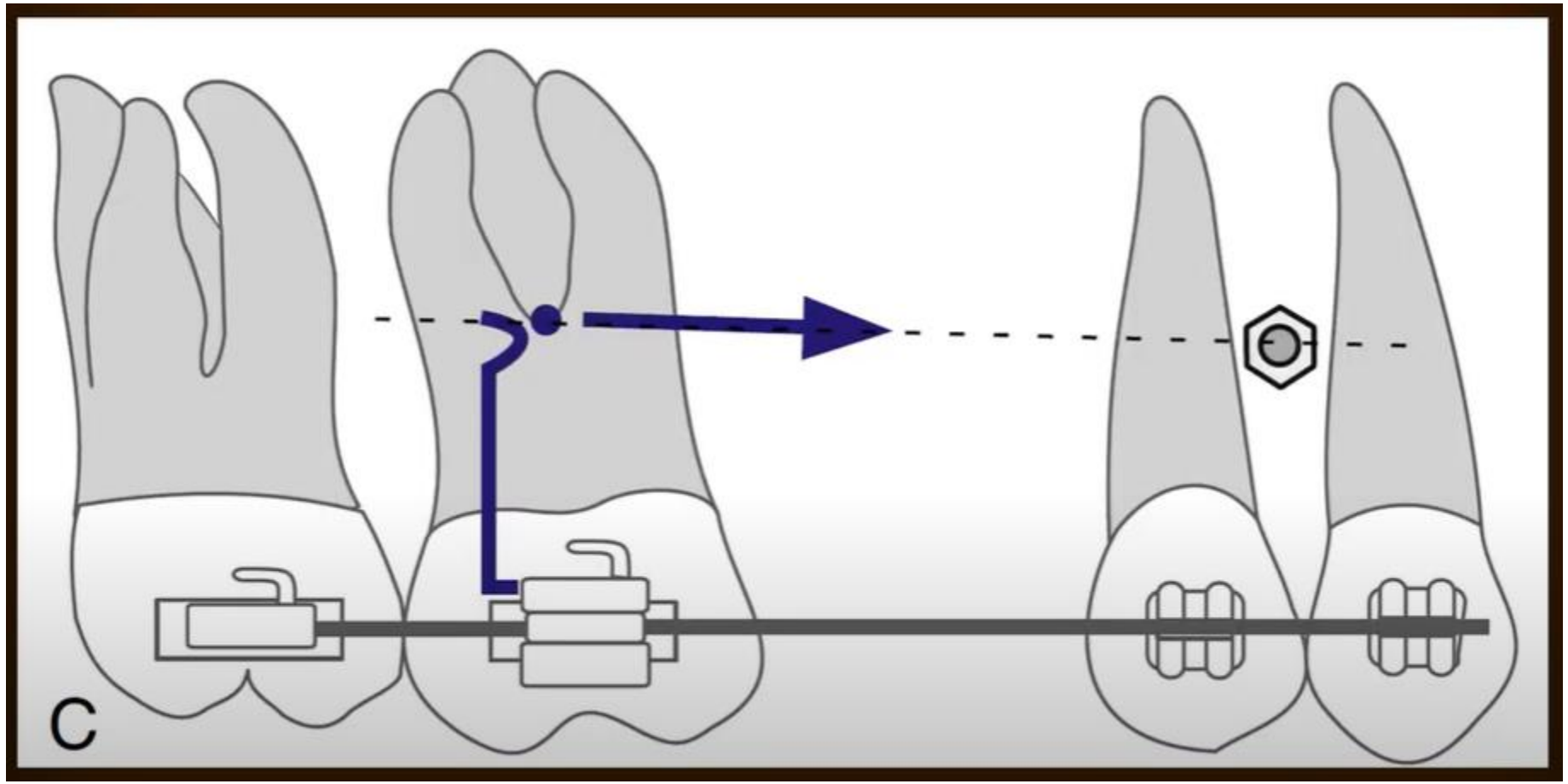


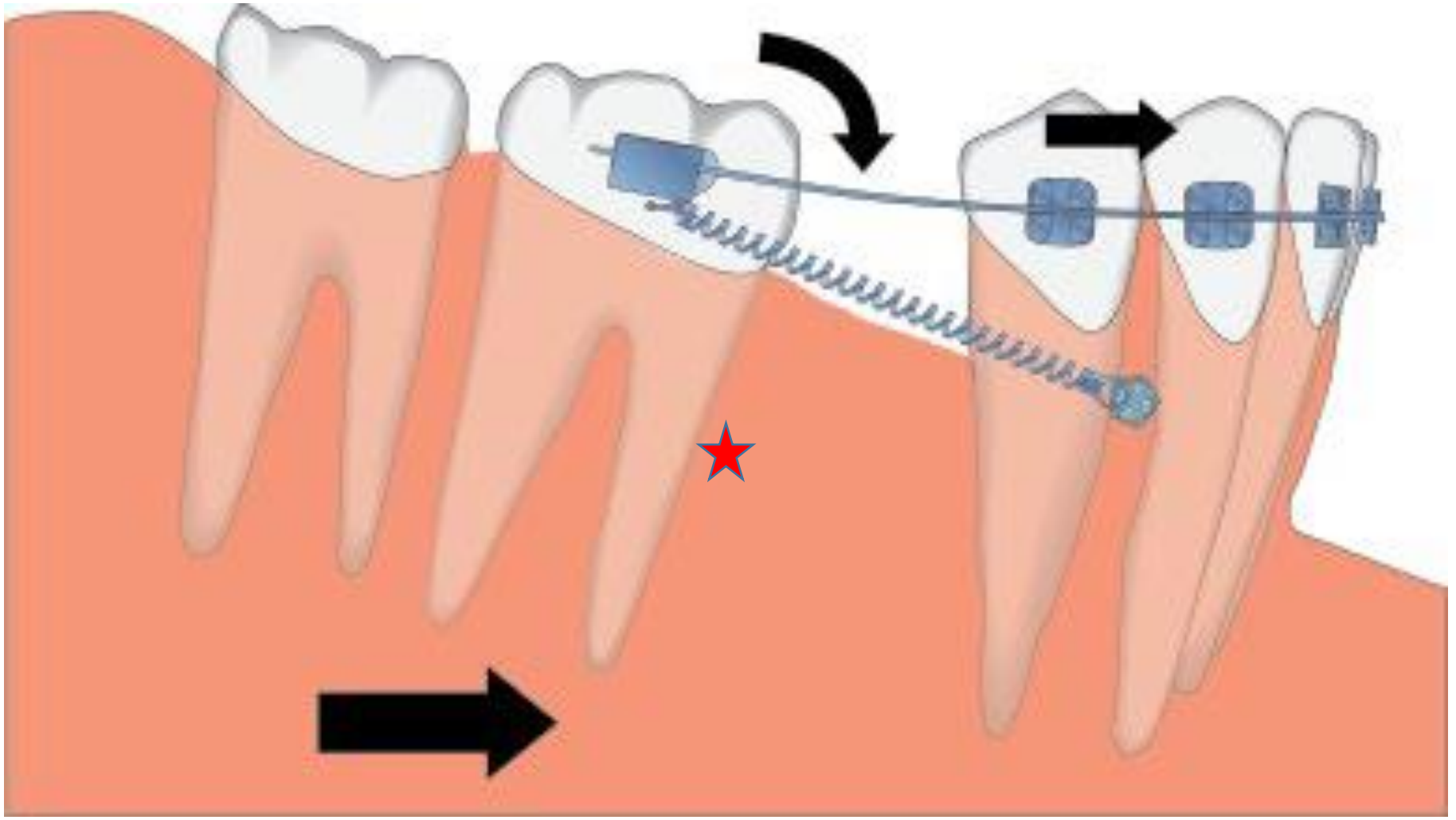

A
B

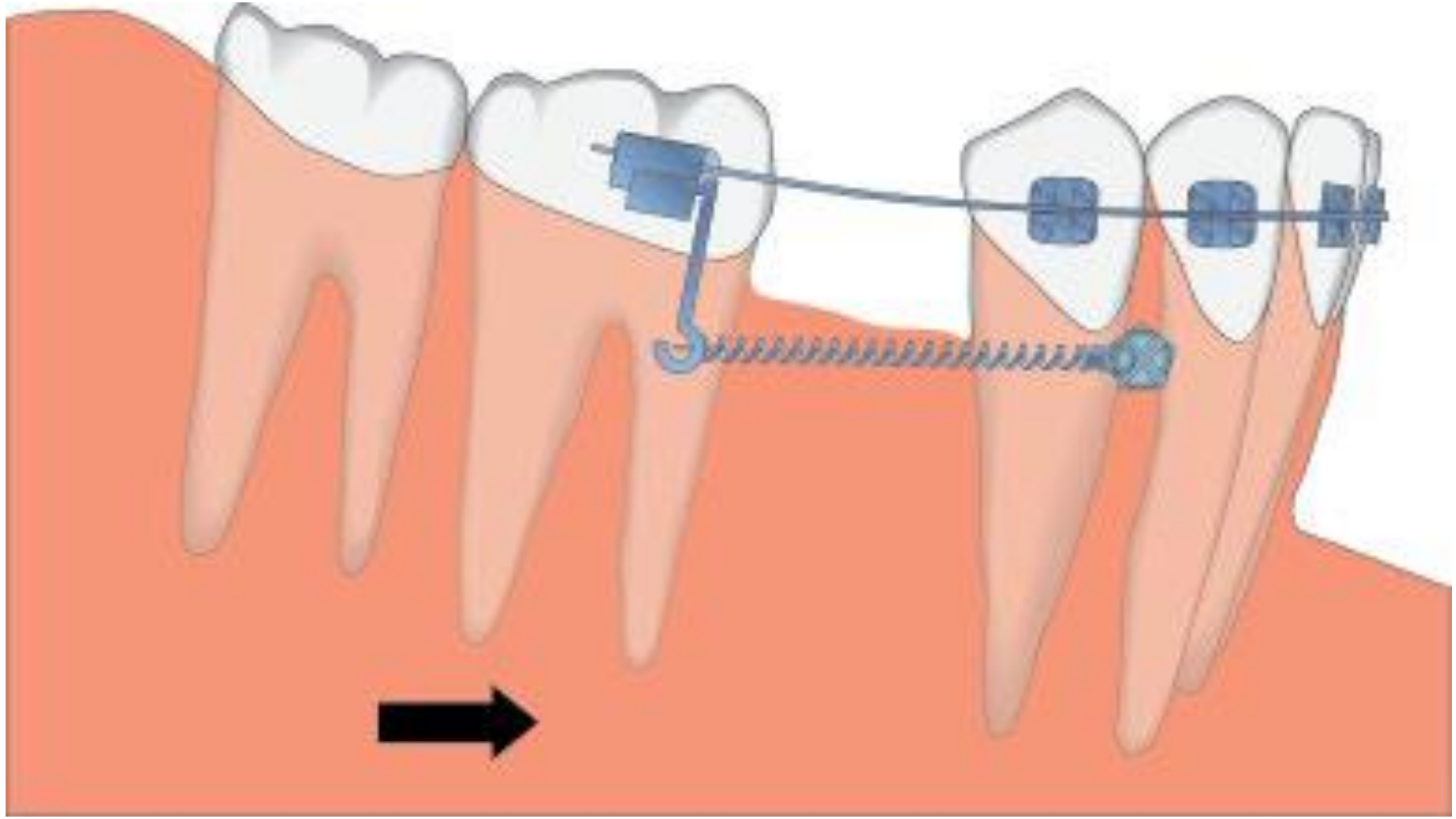
Molar Protraction


A

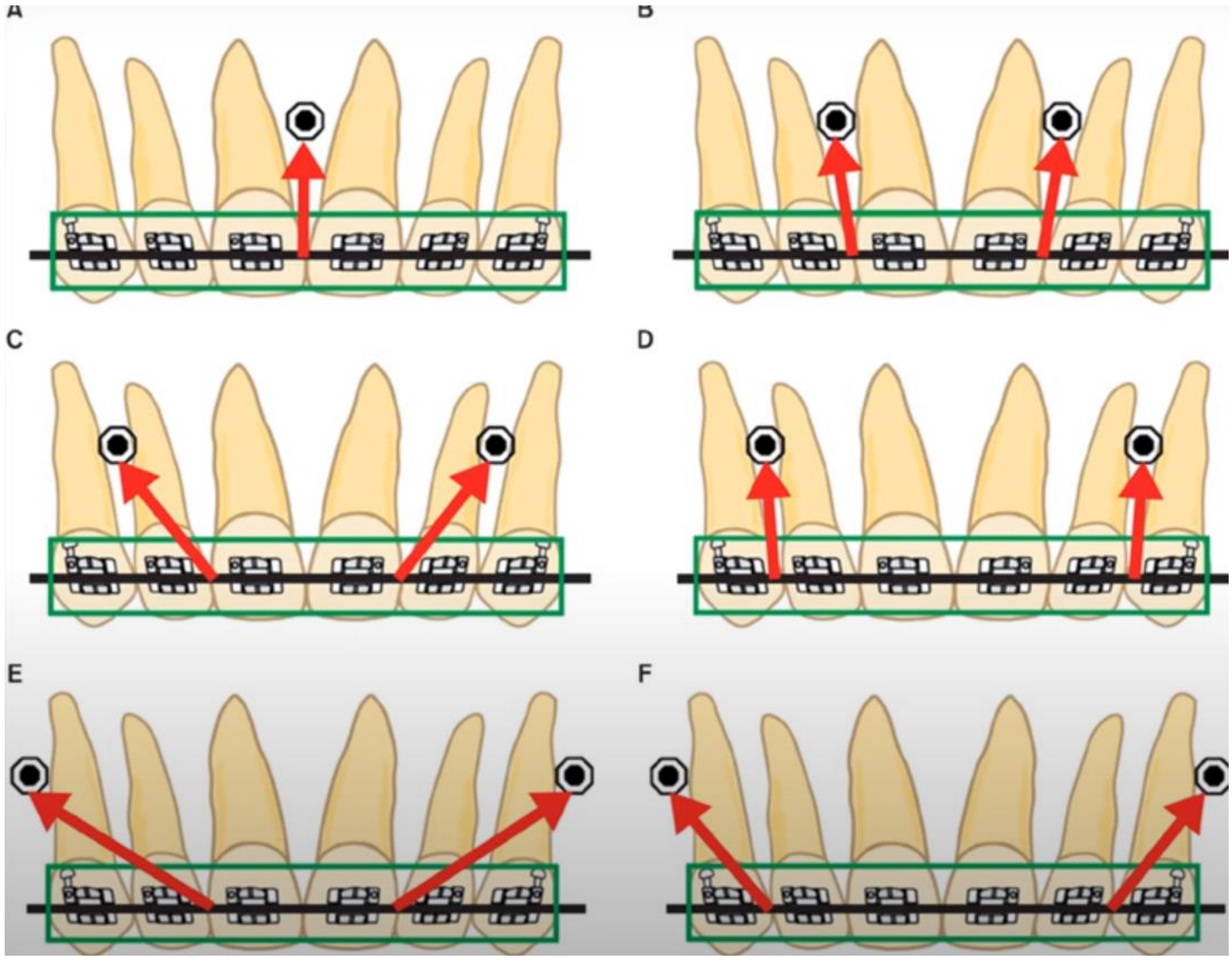

B

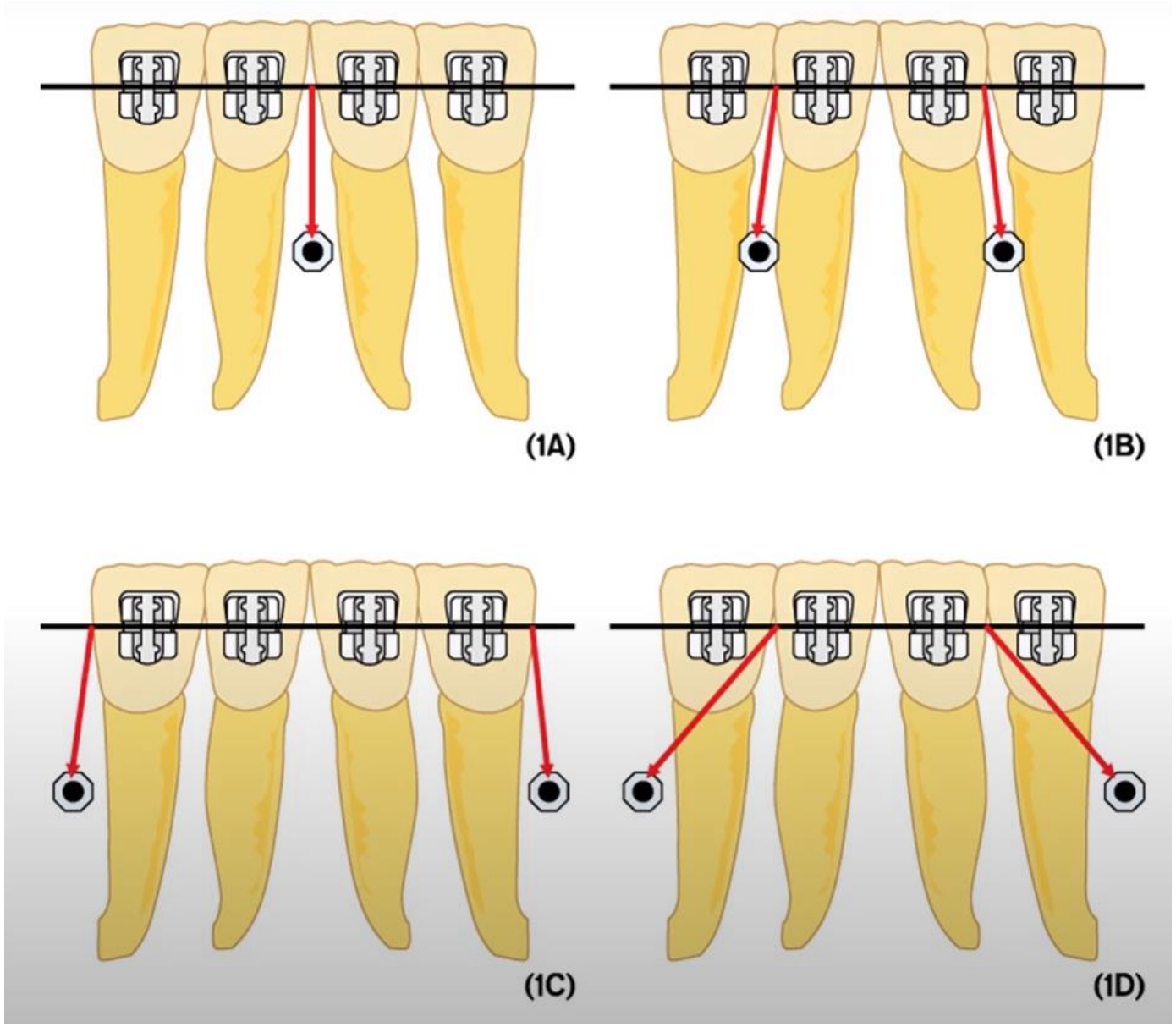

C



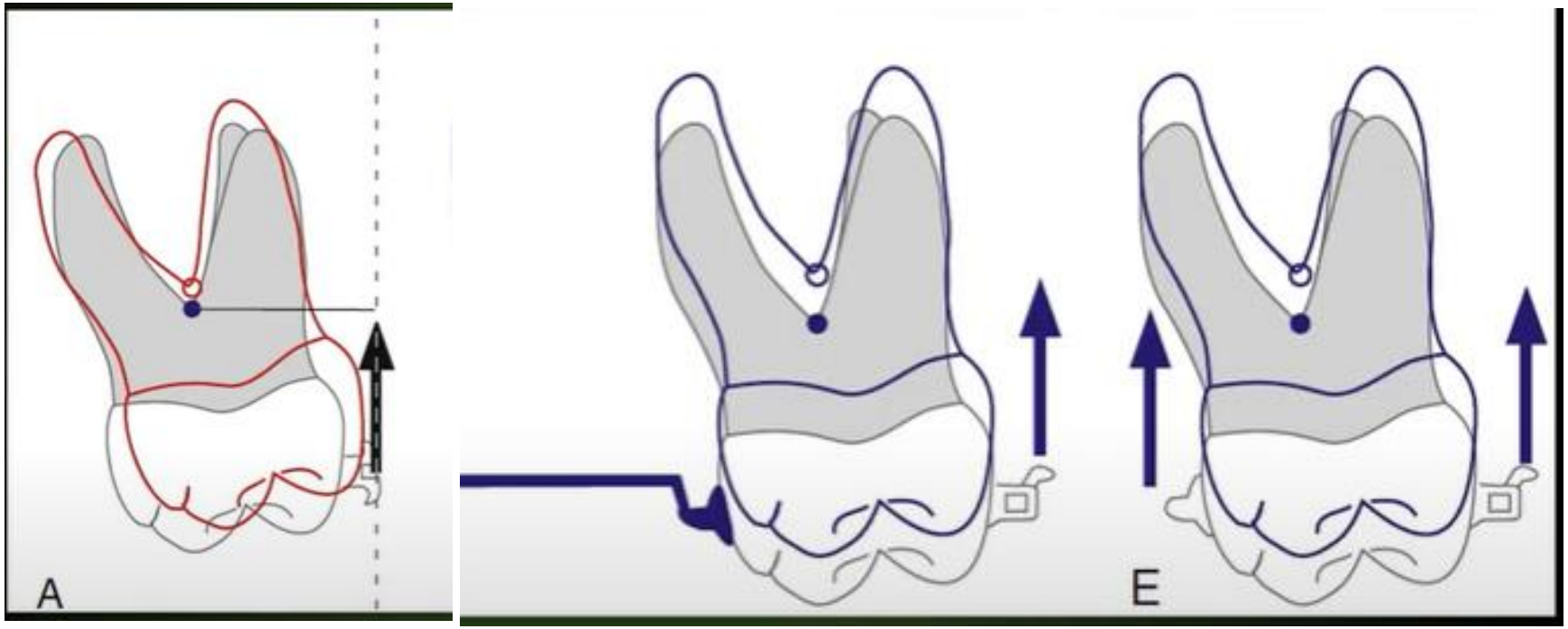
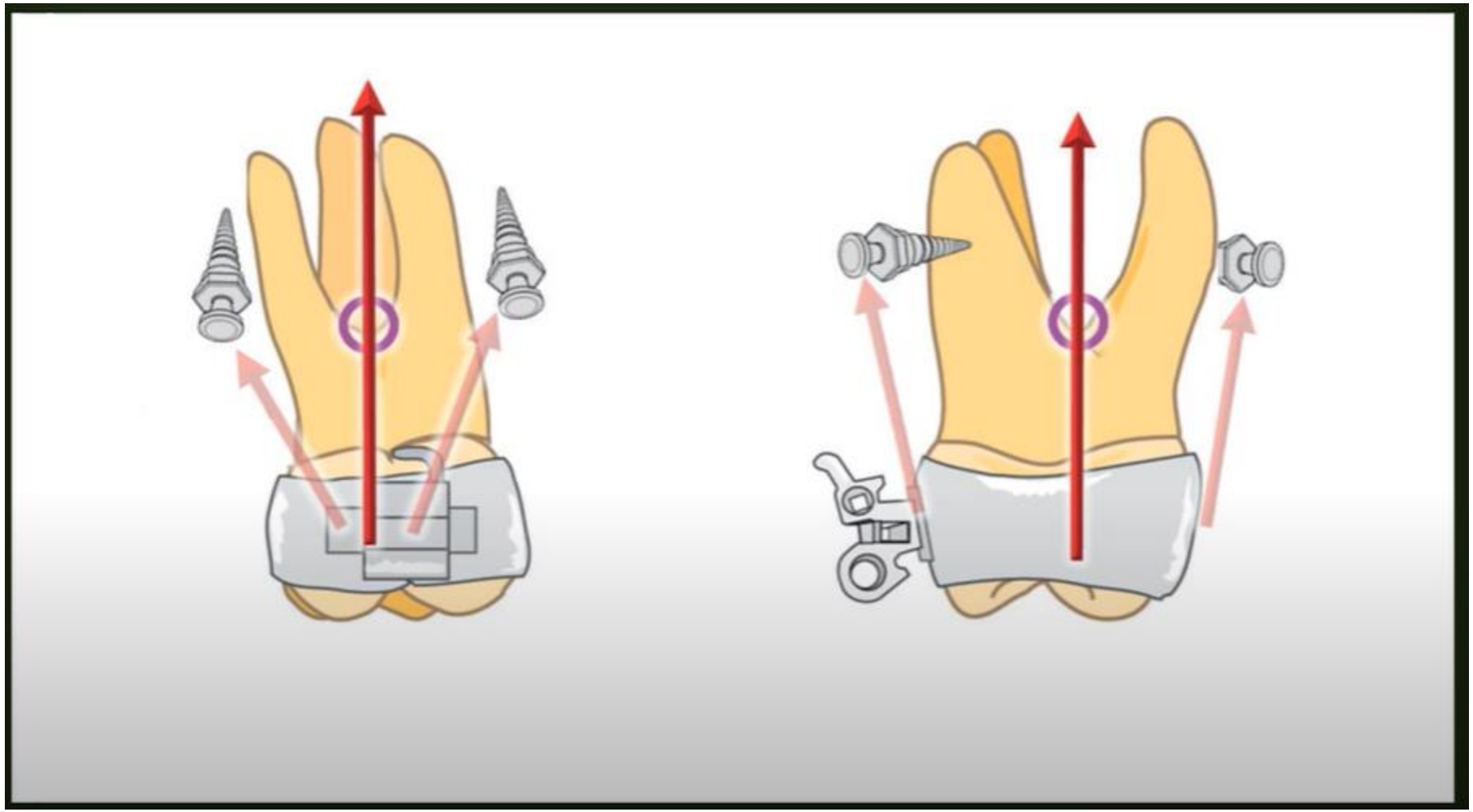


Anterior intrusion


A
B
C
D
E
F


(1A)
(1B)
(1C)
(1D)

posterior intrusion


A
E