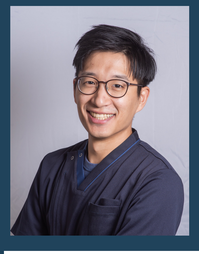

The effectiveness and amount of apical detaching in modified periosteal release incision (MPRI) for tension release procedure: a porcine jaw study

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Background

Tension-free primary closure is mandatory in all augmentation procedures and can be achieved through sufficient flap advancement. This animal study was conducted to measure the amount of flap advancement achieved by modified periosteal release incision (MPRI) and quantitatively analyze the effectiveness of each step of this procedure.

Material and Methods

Flap advancement procedures was carried out on 12 pig jaws. For all pig jaws, full thickness flap with 2 vertical releasing incisions 4 mm beyond mucogingival junction (MGJ) was elevated over the posterior teeth area with 5 mm of edentulous ridge extension to each side (Figure 1 & 4). The modified periosteal release incision (MPRI) was performed, which a shallow periosteum incision of 0.5 mm was executed 2 mm below the MGJ (Figure 5) followed by lateral stretching of the coronal segment of the flap (Figure 6). An apical detaching incision was performed, separating the periosteum of the apical segment from the mucosa (Figure 7). Finally, tunneling of the adjacent mucosa was carried out (Figure 8). The amount of flap advancement was quantitative analyzed on each step of the procedure, including flap elevation, shallow periosteum incision, lateral stretching, apical detaching incision, adjacent tunneling. All the measurements were done by same examiner twice with a tension guage (1 ounce), pulling the flap with suture over the mesial, middle and distal part of the flap (Figure 2). A paired t-test was used to assess differences between each step.

Figure 1

Figure 2

Figure 3 Initial

Figure 4 Flap elevation

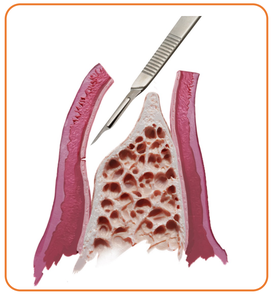


Figure 5 MPRI

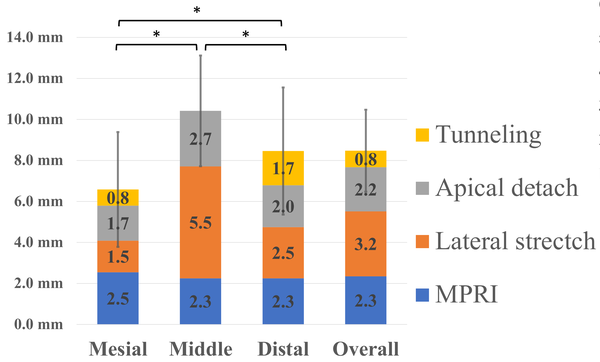
Figure 6 Lateral stretch

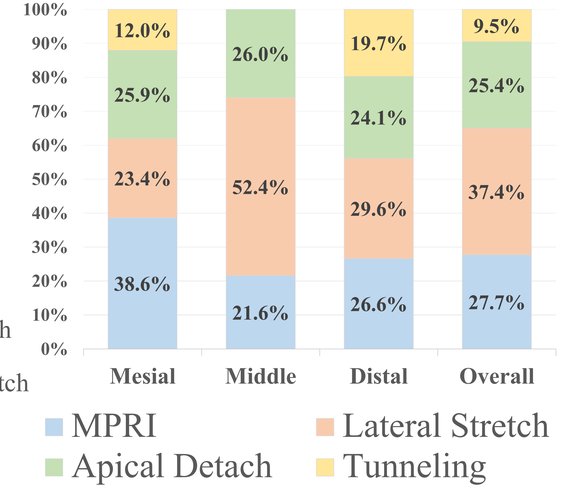
Figure 7 Apical detach

Figure 8 Tunneling

Result

mean (Pig 1 - 12)	Mesial	Middle	Distal	Overall
MPRI	2.5 ± 0.8	2.3 ± 1.4	2.3 ± 1.6	2.3 ± 1.0
Lateral Stretch	1.5 ± 2.0	5.5 ± 2.7	2.5 ± 2.3	3.2 ± 1.8
Apical Detach	1.7 ± 1.5	2.7 ± 1.7	2.0 ± 1.7	2.2 ± 1.3
Adjacent Tunneling	0.8 ± 1.7	0.0 ± 1.6	1.7 ± 1.7	0.8 ± 0.7
Total	6.6 ± 2.8	10.4 ± 2.7	8.5 ± 3.1	8.5 ± 2.0





The mean overall flap advancement following final step of the procedure is 8.5 mm ± 2.0 mm. The largest gain came from the middle part of the flap which is 10.4 mm ± 2.7 mm, while amount of advancement was significantly lower in mesial and distal part of the flap, which was 6.6mm ± 2.4 mm and 8.5 ± 3.1 mm, respectively ($p < 0.05$). The periosteum release incision and lateral stretching was most effective in the middle part of the flap, which saw an advancement of 7.7 mm ± 3.5 mm. With the apical detaching incision, an additional 2.2 mm ± 1.3 mm can be obtained in overall, and which is 27.0% of the total flap advancement. In the final step of the procedure, adjacent tunneling, an additional advancement over mesial and distal part of the flap can be achieved, which was 0.8 mm ± 1.7 mm (12.0%) and 1.7 ± 1.6 mm (19.7%) respectively, with the distal part being significantly higher ($p < 0.05$)..

Conclusion

MPRI is an effective way to achieve sufficient flap advancement. The result of this experiment indicates that the apical detaching incision of the MPRI procedure can add an additional 27.0% of the flap advancement. The additional adjacent tunneling procedure is most effective in the distal part of the flap which can account for 19.7% of advancement of the distal part.