大臼齒拔除後在臨床矯正學上的應用

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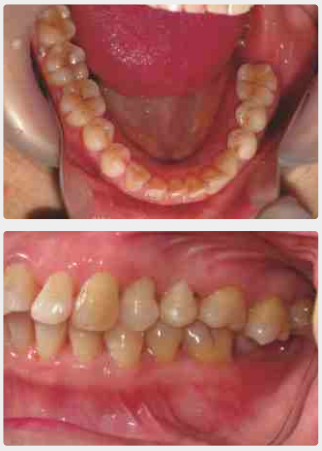
前　言

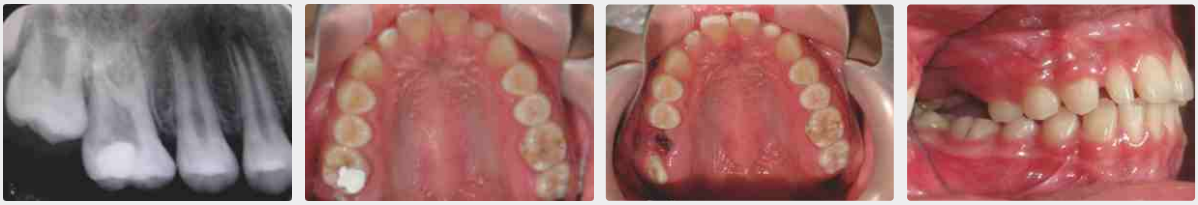
在牙科領域裡拔牙是非常普遍的現像，而術後重建的選擇是我們要考慮的，在適當的時機做適當的事是再完美不過的了，另外我們提供治療計劃的選項是非常重要的，當然治療時間的長短，裝置的多寡，預算的討論及預後結果是彼此雙方能達成共識的重要關鍵。

在臨床上所見第一大臼齒與第二大臼齒蛀牙缺損，或根管治療後牙根斷裂的情況也常發生，當事人患者在拔除後，疏忽或不在意的情況造成日後相鄰牙的傾倒或對側牙的脫出使得日後重建困難，在門診中時有所見。

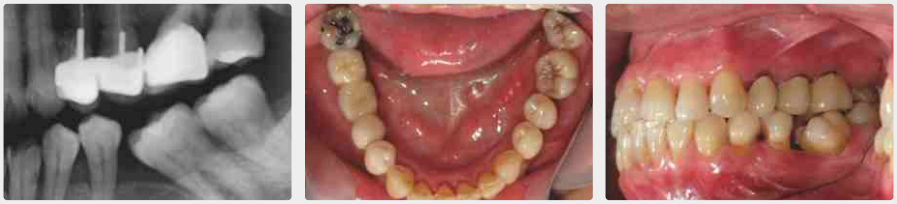
筆者臨床所見，尤其在輕少年時期，發生第一大臼齒深度蛀牙，若拔除第一大臼齒，第二大臼齒接續萌出，實屬必然無庸自疑，是否完全取代第一大臼齒位置？答案是肯定的，唯獨牙根角度無法達到預期，相對應的大臼齒亦有可能脫出。



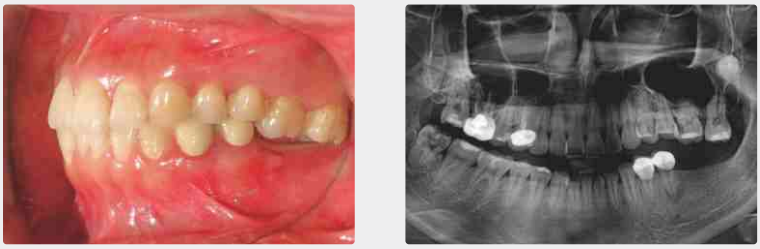
圖示：#37拔除後#27下墜脫出



圖示：上圖#16拔除，#17向前飄移

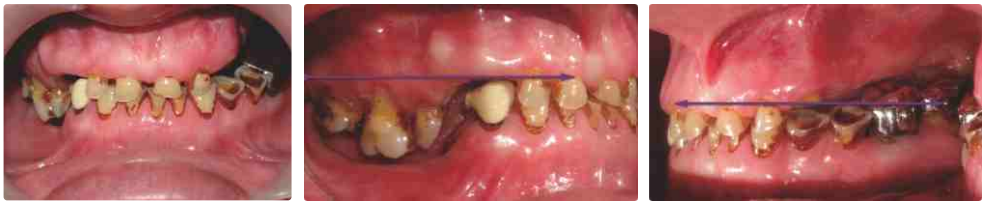


圖示:下圖#36早期拔除，已造成後牙前移與傾倒



圖示：#36 ,37早期喪失,#26,27下墜，幾乎咬到下顎牙床且#26鄰接面蛀牙

大臼齒的缺失除了造成咬合問題外，部分個案亦有顳顎關節的問題發生且因大臼齒前傾(移)，上下大臼齒鄰接面亦有可能蛀牙，更有甚者因雙側大臼齒的喪失，對側牙脫出位移，因咬合的改變而咬合加深有咬合的牙齒容易造成磨損現象。(下圖所示)



由上圖所見，除牙齒嚴重咬耗外，咬合亦完全改變且無牙區對側牙下墜與脫出。

最先萌出的大臼齒比例上壞得最早也較快，一般也容易疏忽，所以在患者拔除已無法保留的牙齒時，隨即要建議病患應該要迅速重建，以保持齒列的完整與咬合功能的正常。

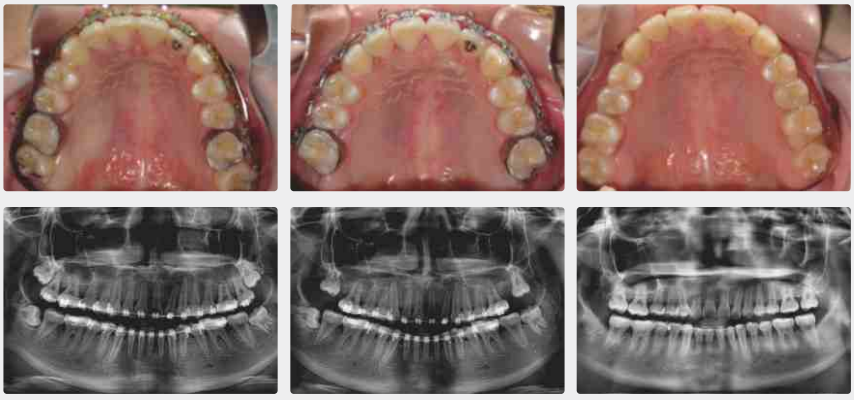
案　例

■ 案例一

問題：在青少年時期智齒若能被利用當不可錯失良機，尤其上顎由於正值第三大臼齒萌發之際，若順勢拔除第二大臼齒，通常不太需要矯正，會自動歸位。

圖示：#17 , 27 拔除前後的相片及X光片

在選擇拔除第二大臼齒時，家長通常會擔心是否有其必要性，上圖個案呈現的是拔除上顎第二大臼齒，除解決了前齒區空間不足外，日後亦不必再手術拔除第三大臼齒，自動歸位乃天時地利人和也！當然大部分的個案仍需藉助矯正處理。



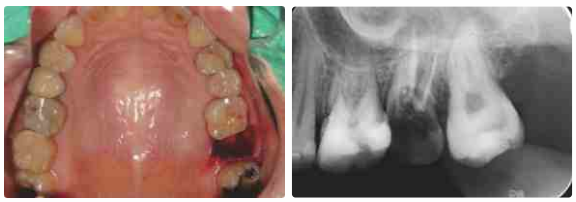
■ 案例二

如果已成年且第三大臼齒牙根尖也發育完全，而且已完全萌出，自動歸位已無機會，此時勢必用矯正方式來處理。

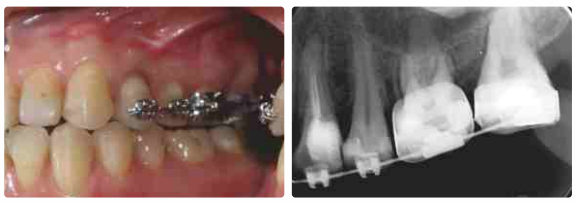
年齡： 28 y/o Female

問題：#27 斷裂拔除，他診所建議植牙，而#28前移的方式亦可考慮。

治療時間大約半年



#27 斷裂拔除

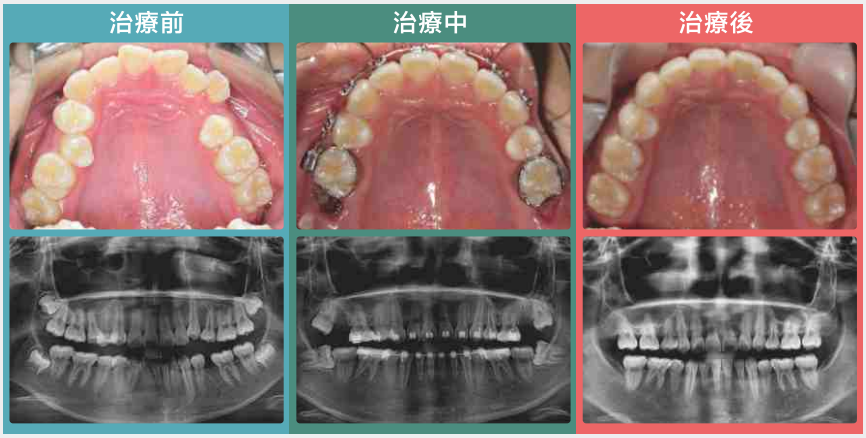


#28矯正往前移

■ 案例三

年齡： 18y/o Female

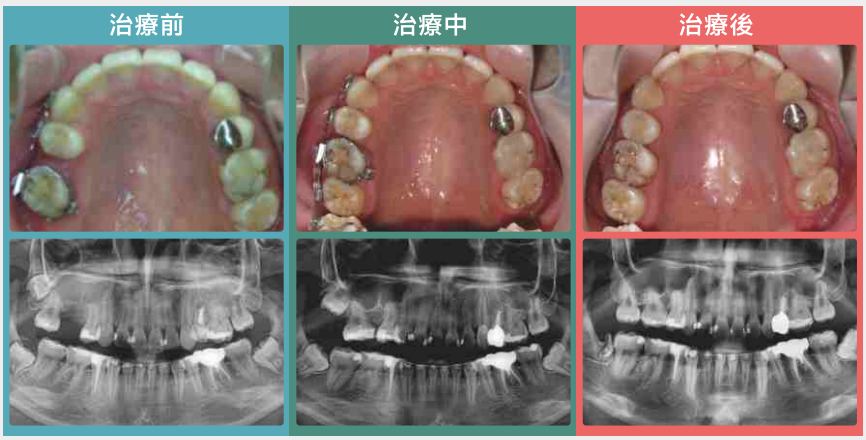
問題：4 bicuspid ext.由於齒列擁擠空間不足，至後期前齒區無咬合，空間仍不足，此時拔除#17,27 以利上顎齒列後退，除改善前齒區咬合問題 #18,28亦自動到位。



■ 案例四

年齡：18 y/o female

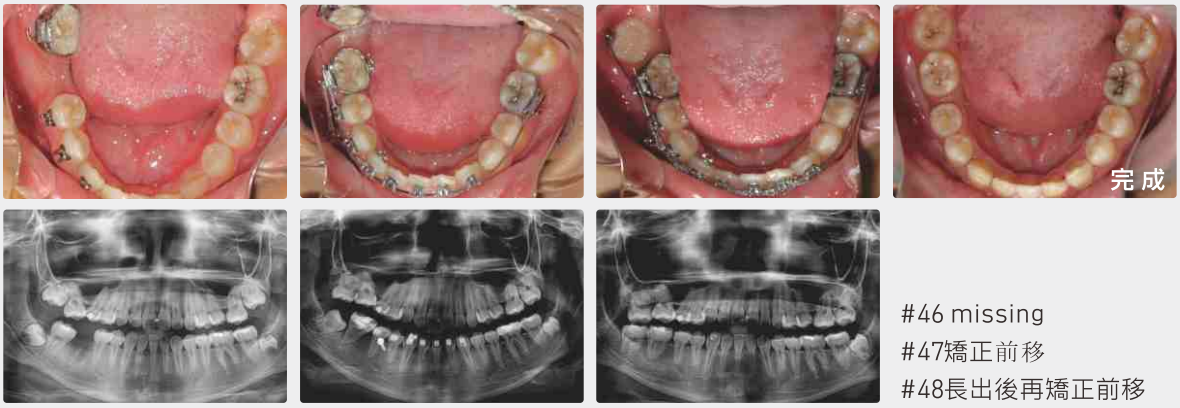
問題：原國中階段矯正完成，數年後 #16因齲齒在他診所拔除並建議植牙，之後#17 經局部矯正前移，待#18萌出再前移扶正。



■ 案例五

年齡 : 17y/o female

問題 : #46 missing 下顎局部矯正,將#47前移，接續#48萌出後再矯正前移。



#46 missing
#47矯正前移
#48長出後再矯正前移

結　論

1. 大臼齒前移在臨床矯正治療上是可行的，如大臼齒向前牽引尤其僅僅以前牙錨定，容易造成前牙向舌側傾倒及後牙向舌側內縮，如果事先預防以骨釘或活動裝置輔助，則大臼齒前移效果較佳。
2. 當第一或第二大臼齒蛀蝕斷裂或缺損在拔除時是在青少年時期，事先宜考慮第二或第三大臼齒是否有利用價值。
3. 門診中拔牙，時有所見，通常當事人拔牙後疼痛解決即消失無蹤，在拔除當下理當善盡告知其後果之責，以保持齒列完整。
4. 當第一或第二大臼齒拔除後即刻處理，效果較佳，若拖延時日過久，再要移動第二或第三大臼齒難度極高，徒勞無功。
5. 上下顎大臼齒前移比較，基本上以上顎大臼齒前移較下顎大臼齒前移較易操控，所以要注意的是在移動牙齒時不宜有其他的分力造成上下咬合齒列的改變。

附註 : 配合此文，相關內容細節，**於桃園牙醫師公會11 月17日學術演講，**以分享後進，略盡棉薄。

壁報論文比賽 醫院組第二名作品欣賞

林口長庚ㄧ梅至君、洪祥熙

Biomarker expressions of the calcitriol and enamel matrix derivative regulated periodontal cell

牙周衍生細胞受牙釉基質衍生物與骨化三醇調控之生物標記

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Introduction

Calcidiol is hydroxylated in the kidneys and converted to an active steroid hormone vitamin D_3 (Vit.D_3). Vit.D_3 can stimulate and promote osteogenic related activities by stimulating alkaline phosphatase (ALP) activity, up-regulating Core-binding factor subunit alpha-1/ runt-related transcription factor 2 (Cbfa1/ RUNX2) mRNA and bone matrix proteins such as osteopontin (OPN), osteocalcin (OCN), Collagen-I (Col-1).[1-3] Intracellularly, Vit.D_3/vitamin D receptor (VDR)/retinoid X receptors (RXR) complex can bind to vitamin D target genes to regulate subsequent activities of Vit.D_3-responsive elements.[2,4] Besides, Vit.D_3 was implied to antagonize inflammation in human periodontal tissue by down-regulating pro-inflammatory cytokine interleukin-6 (IL-6) expression and reducing the bioavailability of transforming growth factor-β1 (TGF-β1).[5,6]

Enamel matrix derivative (EMD), a group of purified extract of enamel matrix proteins, promotes periodontal ligament (PDL) fibroblast proliferation and growth to contribute to periodontal regeneration and cementum formation.[7] EMD stimulates PDL multipotent stromal cells to release autocrine growth factors, such as TGF-β1, platelet-derived growth factor AB (PDGF-AB) and IL-6 to promote periodontal healing and regeneration by mimicking natural root development; it also stimulates osteoprotegerin (OPG) to trigger osteoblast proliferation and indirectly inhibiting both osteoclastogenesis and osteoclastic function, both of which are imperative for desired alveolar bone regeneration.[8,9]

Limited studies compared Vit.D_3 to EMD on cemento-induction related mRNAs in human periodontal ligament derived cells (hPDCs). The objectives of present study were to examine the effects of various concentrations EMD and Vit.D_3 on cemento-inductive and osteoinductive molecules at the mRNA, protein and extracellular mineralization levels in hPDCs.

Material and methods

The hPDCs were obtained and cultured from healthy individuals who were undergoing premolar extractions for orthodontic treatment or for third molar malposition extraction. These cells were isolated and cultured using a standard protocol, and then cells were treated with varying concentrations of Vit.D_3 and EMD. Five groups, categorized as control, 10^{-8}M (10 nM) Vit.D_3, 10^{-7}M (100 nM) Vit.D_3, 50μg/ml EMD and 100 μg/ml EMD were tested. The mRNA expressions of core-binding factor subunit alpha-1 (Cbfa1), collagen1 α1 (Col-I), alkaline phosphatase (ALP), osteopontin (OPN), bone sialoprotein (BSP), osteocalcin (OCN), vitamin D receptor (VDR), cementum protein 1 (CEMP1), cementum attachment protein (CAP), interleukin 6 (IL-6), transforming growth factor-β1 (TGF-β1) and osteoprotegerin (OPG) were examined by quantitative real-time polymerase chain reaction and the fold-changes were assessed at 1st and 2nd week after treatment. In addition, the hPDCs were assessed for ALP activity, Von Kossa stain, Alizarin red assay and immunofluorescence staining to examine the quantity of osteogenesis and cementogenesis. The differences were compared and analyzed by Wilcoxon test at a significance level of $P<0.05$.

Results

It showed that 10^{-8}M Vit.D_3 significantly enhanced greater expressions of Cbfa1, Col-1, ALP, OPN, BSP, OCN, VDR, CEMP-1, IL-6 and TGF-β1 mRNAs than control and EMD. Compared to the controls, the two tested concentrations of EMD increased greater Col-1 and CAP mRNAs fold-changes at both weeks. In addition, EMD stimulated greater CAP and OPG mRNA fold-changes in comparison with 10^{-8}M Vit.D_3. (Figure1 and Table1)

The 10^{-8}M Vit.D_3 at both weeks presented the most significant up-regulation among the groups in ALP activity. (Figure 2)

As to the von Kossa test (Figure 3) and Alizarin Red assay (Figure 4), 10^{-8}M Vit.D_3 group responded consistently and significantly at fourth and fifth week.

Additionally, 100μg/ml EMD exhibited a more significant reaction than 50μg/ml EMD, especially at fifth week. and In the immunofluorescence expression, EMD treated cells revealed a significant CEMP-1 (Figure 5) and CAP (Figure 6) at fourth and fifth weeks, especially for the 100 μg/ml EMD group.

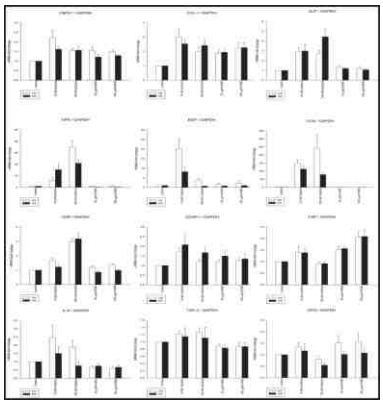

Figure 1: Comparisons of the mineralization related RNAs adjusted by Vit.D_3 and EMD.

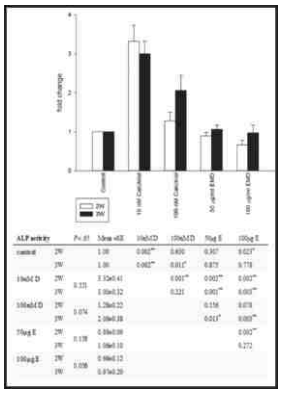

Figure 2: ALP enzyme activity analyses.

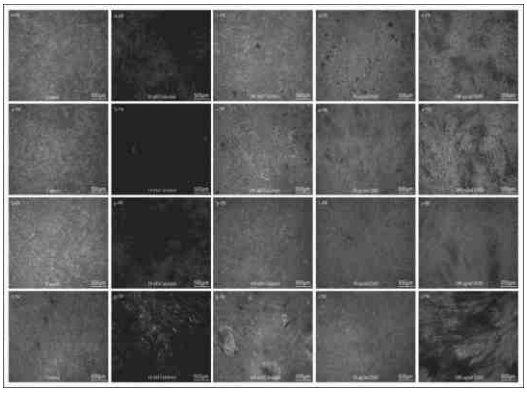

Figure 3: Von Kossa stain.
Upper panels showed 4th week's von Kossa stain and lower panels demonstrated 5th week' stain.

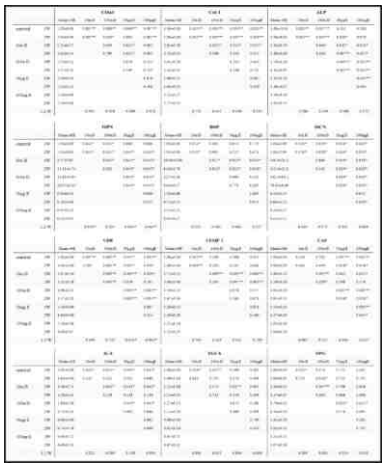

Table 1: Fold-changes of mineralization related RNAs regulated by Vit.D_3 and EMD.
Wilcoxon test: *$p<0.05$, **$p<0.01$

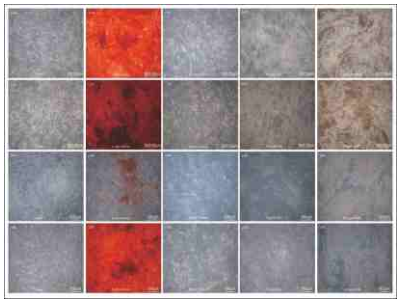

Figure 4: Alizarin Red examination.
Upper panels showed 4th week's Alizarin Red stain and lower panels demonstrated 5th week' stain.

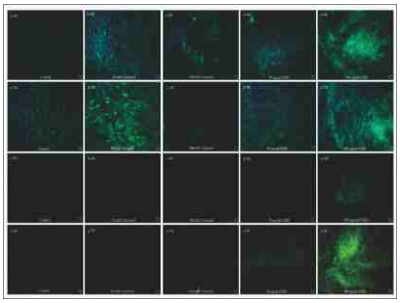

Figure 5: CEMP-1 Immunofluorescence assay.
Upper panels showed 4th week's CEMP-1 expression and lower panels demonstrated 5th week's expression.

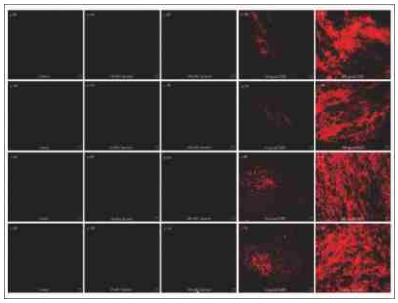

Figure 6: CAP Immunofluorescence assay.
Upper panels showed 4th week's CAP expression and lower panels demonstrated 5th week's expression.

Discussion

Vit.D_3 significantly up-regulated all the tested biomarkers except for CAP mRNA in this study. Increased expression of other tested parameters in this trial demonstrated a significant enhancement on cementoblastic differentiation. These positive results of Vit.D_3 enhancement suggested that Vit.D_3 was not only critical for osteoinduction but also essential in cementogenesis. Additionally, Vit.D_3 promoted mild CEMP-1 immunofluorescence expression that implied Vit.D_3 could be cemento-inductive as well.

On the other hand, EMD significantly enhanced Cbfa1, Col-1, ALP, VDR and CAP mRNA expressions. Since CAP is mostly related to cementogenesis instead of osteogenesis, the finding denoted that EMD is more involved in regulating the formation of cementum.

Von Kossa stain was applied to quantify mineralization in vitro; however, Alizarin Red reacts with calcium cation to form a chelate and was therefore employed to confirm the existence of calcium.[10] The significant intensifications of ALP enzyme activity, Alizarin Red expression and Von Kossa stain supported that 10^{-8}M Vit.D_3 would be osteoinductive. EMDs responded to von Kossa stain mild-moderately; whereas, insignificant Alizarin Red expression decreased the possible association of EMD and osteoinduction.

Conclusion

Vit.D_3's up-regulation of Cbfa1, Col-1, ALP, OPN, BSP, OCN, VDR, CEMP-1, IL-6, TGF-β1, OPG mRNAs, ALP enzyme activity, CEMP-1 immunofluorescence manifestation, Alizarin Red expression, and von Kossa stain supported that Vit.D_3 were osteoinductive and cemento-inductive potentially. EMDs promoted mineralization expression of Cbfa1, Col-1, ALP, VDR and CAP mRNAs but down-regulated OPN, OCN, IL-6 mRNAs expression and ALP enzyme activity. Compared to EMD, Vit.D_3's greater impact on osteoinductive parameters implies that Vit.D_3 and EMD could facilitate periodontal regeneration via diverse stimulations.

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Biomarker expressions of the calcitriol and enamel matrix derivative regulated periodontal cells

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Enamel matrix derivative (EMD), a group of purified extract of enamel matrix proteins, promotes periodontal ligament (PDL) fibroblast proliferation and growth to contribute to periodontal regeneration and cementum formation.[7] EMD stimulates PDL multipotent stromal cells to release autocrine growth factors, such as TGF-β1, platelet-derived growth factor AB (PDGF-AB) and IL-6 to promote periodontal healing and regeneration by mimicking natural root development; it also stimulates osteoprotegerin (OPG) to trigger osteoblast proliferation and indirectly inhibiting both osteoclastogenesis and osteoclastic function, both of which are imperative for desired alveolar bone regeneration. [8,9]

Limited studies compared Vit.D_3 to EMD on cemento-induction related mRNAs in human periodontal ligament derived cells (hPDCs). The objectives of present study were to examine the effects of various concentrations EMD and Vit.D_3 on cemento-inductive and osteoinductive molecules at the mRNA, protein and extracellular mineralization levels in hPDCs.

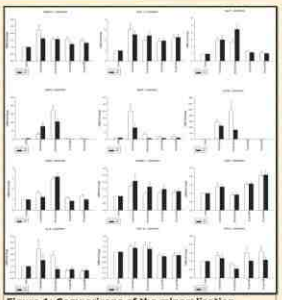

Figure 1: Comparisons of the mineralization related RNAs adjusted by Vit.D_3 and EMD.

Material and methods

The hPDCs were obtained and cultured from healthy individuals who were undergoing premolar extractions for orthodontic treatment or for third molar malposition extraction. These cells were isolated and cultured using a standard protocol, and then cells were treated with varying concentrations of Vit.D_3 and EMD. Five groups, categorized as control, 10^{-8}M (10 nM) Vit.D_3, 10^{-7}M (100 nM) Vit.D_3, 50μg/ml EMD and 100 μg/ml EMD were tested. The mRNA expressions of core-binding factor subunit alpha-1 (Cbfa1), collagen1 α1 (Col-I), alkaline phosphatase (ALP), osteopontin (OPN), bone sialoprotein (BSP), osteocalcin (OCN), vitamin D receptor (VDR), cementum protein 1 (CEMP1), cementum attachment protein (CAP), interleukin 6 (IL-6), transforming growth factor-β1 (TGF-β1) and osteoprotegerin (OPG) were examined by quantitative real-time polymerase chain reaction and the fold-changes were assessed at 1st and 2nd week after treatment. In addition, the hPDCs were assessed for ALP activity, Von Kossa stain, Alizarin red assay and immunofluorescence staining to examine the quantity of osteogenesis and cementogenesis. The differences were compared and analyzed by Wilcoxon test at a significance level of *P<0.05*.

Results

It showed that 10^{-8}M Vit.D_3 significantly enhanced greater expressions of Cbfa1, Col-1, ALP, OPN, BSP, OCN, VDR, CEMP-1, IL-6 and TGF-β1 mRNAs than control and EMD. Compared to the controls, the two tested concentrations of EMD increased greater Col-1 and CAP mRNAs fold-changes at both weeks. In addition, EMD stimulated greater CAP and OPG mRNA fold-changes in comparison with 10^{-8}M Vit.D_3. (Figure1 and Table1)

The 10^{-8}M Vit.D_3 at both weeks presented the most significant up-regulation among the groups in ALP activity. (Figure 2)

As to the von Kossa test (Figure 3) and Alizarin Red assay (Figure 4), 10^{-8}M Vit.D_3 group responded consistently and significantly at fourth and fifth week.

Additionally, 100μg/ml EMD exhibited a more significant reaction than 50μg/ml EMD, especially at fifth week. and In the immunofluorescence expression, EMD treated cells revealed a significant CEMP-1 (Figure 5) and CAP (Figure 6) at fourth and fifth weeks, especially for the 100 μg/ml EMD group.

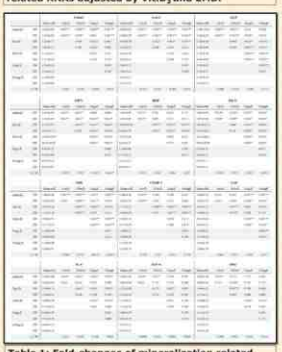

Table 1: Fold-changes of mineralization related RNAs regulated by Vit.D_3 and EMD.
Wilcoxon test: * $p<0.05$, ** $p<0.01$

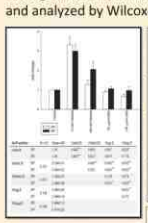

Figure 2: ALP enzyme activity analyses.

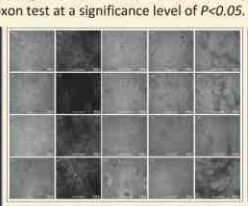

Figure 3: Von Kossa stain.
Upper panels showed 4th week's von Kossa stain and lower panels demonstrated 5th week' stain.

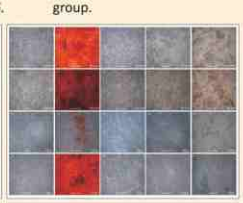

Figure 4: Alizarin Red examination.
Upper panels showed 4th week's Alizarin Red stain and lower panels demonstrated 5th week' stain.

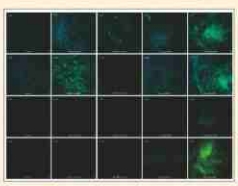

Figure 5: CEMP-1 Immunofluorescence assay. Upper panels showed 4th week's CEMP-1 expression and lower panels demonstrated 5th week's expression.

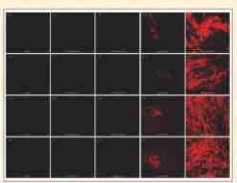

Figure 6: CAP Immunofluorescence assay.
Upper panels showed 4th week's CAP expression and lower panels demonstrated 5th week's expression.

Discussion

Vit.D_3 significantly up-regulated all the tested biomarkers except for CAP mRNA in this study. Increased expression of other tested parameters in this trial demonstrated a significant enhancement on cementoblastic differentiation. These positive results of Vit.D_3 enhancement suggested that Vit.D_3 was not only critical for osteoinduction but also essential in cementogenesis. Additionally, Vit.D_3 promoted mild CEMP-1 immunofluorescence expression that implied Vit.D_3 could be cemento-inductive as well.

On the other hand, EMD significantly enhanced Cbfa1, Col-1, ALP, VDR and CAP mRNA expressions. Since CAP is mostly related to cementogenesis instead of osteogenesis, the finding denoted that EMD is more involved in regulating the formation of cementum.

Von Kossa stain was applied to quantify mineralization in vitro; however, Alizarin Red reacts with calcium cation to form a chelate and was therefore employed to confirm the existence of calcium.[10] The significant intensifications of ALP enzyme activity, Alizarin Red expression and Von Kossa stain supported that 10^{-8}M Vit.D_3 would be osteoinductive. EMDs responded to von Kossa stain mild-moderately; whereas, insignificant Alizarin Red expression decreased the possible association of EMD and osteoinduction.

Conclusion

Vit.D_3's up-regulation of Cbfa1, Col-1, ALP, OPN, BSP, OCN, VDR, CEMP-1, IL-6, TGF-β1, OPG mRNAs, ALP enzyme activity, CEMP-1 immunofluorescence manifestation, Alizarin Red expression, and von Kossa stain supported that Vit.D_3 were osteoinductive and cemento-inductive potentially. EMDs promoted mineralization expression of Cbfa1, Col-1, ALP, VDR and CAP mRNAs but down-regulated OPN, OCN, IL-6 mRNAs expression and ALP enzyme activity. Compared to EMD, Vit.D_3's greater impact on osteoinductive parameters implies that Vit.D_3 and EMD could facilitate periodontal regeneration via diverse stimulations.

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壁報論文比賽 診所組第二名作品欣賞

A21牙醫－高秉宏

立即植牙之思考: Case reports

作者：高秉宏醫師

摘　要

針對前牙或小臼齒面臨拔牙時，植牙的方式和時機點，筆者給予分析與建議。並提供2個臨床案例予以說明：除了delayed implantation的植牙方式，在軟硬組織條件許可的情況下可立即植牙，無論成功率或美學結果，不亞於傳統的植牙方式，並可大大縮短病人治療時間及減少手術次術。

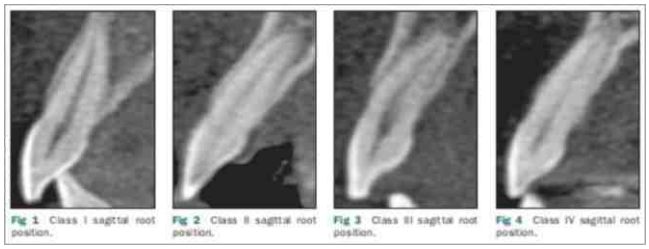
前　言

立即植牙需要考量2個部份:軟組織和硬組織。Salama 2007年的立即植牙的分類裡頭[1](圖1)，只要擁有足夠的bone for primary stability and ideal implant position，皆可考慮立即植牙。而在Joseph Kan的分類裡頭[2]，有90%左右的前牙骨頭型態(class 1~class 3)適合立即植牙(圖2)

Table 1 Classification of immediate implant placement

Class	Buccal bone	Viable implant placement technique	Expected results of immediate implant placement	Indication for immediate implant placement
Class 1	Intact with thick gingival biotype	Immediate without flap reflection	Optimal	Yes
Class 2	Intact with thin gingival biotype	Immediate with CTG or staged CTG	Good	Yes
Class 3	Deficient but implant placement possible in remaining alveolar housing of extraction socket	Simultaneous immediate with GBR and CTG or followed by staged CTG	Acceptable	Limited
Class 4	Deficient and implant may deviate from alveolar housing	Delayed	Unacceptable	No

(圖1)



(圖2)

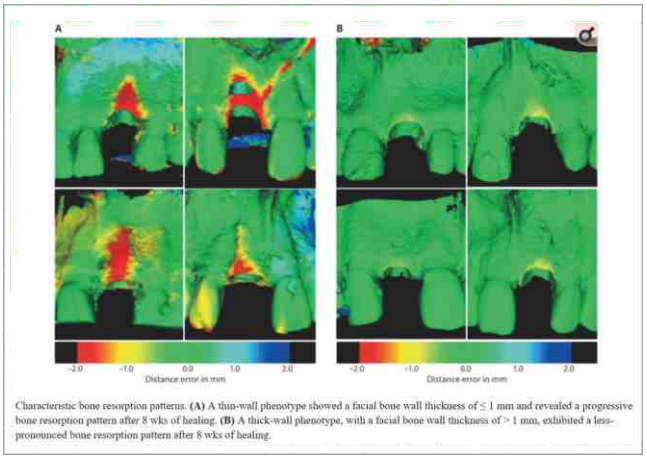
但在Buser的分類裡頭[3](圖3)更喜歡將頰側軟硬組織的厚度做個考量，將大於1 mm的頰側骨頭且厚的gingiva biotype做為立即植牙的indication。而小於1 mm的骨板則建議拔牙後等待4~8週，待軟組織長好後再做植牙手術。根據CBCT的研究[4,5]觀察軟硬組織在拔牙後的變化，說明了大於1 mm的骨板只有微量(1 mm)的垂直骨吸收(圖4，5)，骨板在8週後幾乎還存在；但若是骨板厚度小於1 mm，在拔牙後的8週會有明顯的垂直骨吸收(7.5 mm)，骨板幾乎會被吸收掉，取而代之的是增厚的軟組織(在植牙手術時，可以提供GBR時足夠的軟組織做primary closure，避免MGJ的位置改變太多而需要再做APF，甚至可以降低做CTG的可能性)。

不論要依據哪種分類，前提是需要確認手術區沒有急性的感染，且有足夠的骨頭提供primary stability，且植體要在理想的位置上。

Table 2. Selection criteria and surgical aspects of each treatment option

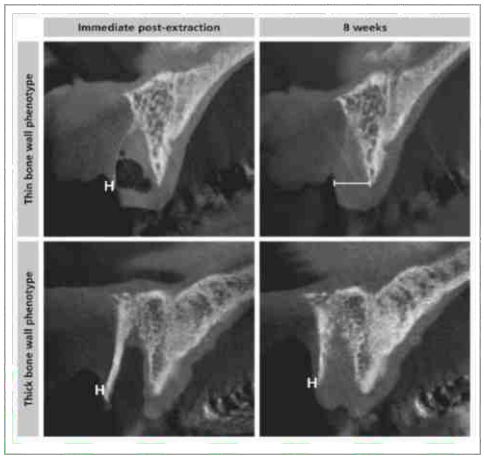
Terminology	Immediate implant placement	Early implant placement with soft tissue healing	Early implant placement with partial bone healing	Late implant placement	
Classification	Type I	Type II	Type III	Type IV with prior socket grafting for ridge preservation	Type IV without socket grafting for ridge preservation
Healing period prior to implant placement	None	4–8 weeks	12–16 weeks	6 months or longer	6 months or longer (often years)
Selection criteria	Intact facial bone wall with thick wall phenotype (> 1 mm). Thick soft tissue biotype No acute infection in the socket. Sufficient bone volume apically to stabilize the implant in a correct 3D position	Thin or damaged facial bone wall Sufficient bone volume apically to stabilize the implant in a correct 3D position	Large periapical bone lesion which does not allow type I or II placement	Adolescent patients too young for implant therapy (age < 20 years). Extended bone lesions apical and palatal to the root. Ankylosed root in apical position without bone volume apically to the root	Extended delay in implant placement post-extraction for patient or site-related reasons
Surgical aspects	Flapless approach whenever possible Internal augmentation	Open flap procedure Contour augmentation with guided bone regeneration	Open flap procedure Contour augmentation with guided bone regeneration	Open flap procedure Contour augmentation with guided bone regeneration	If sufficient bone volume, open flap procedure and contour augmentation with guided bone regeneration. If insufficient bone volume, staged bone augmentation. Subsequent implant placement most often further grafting for contour augmentation
Difficulty level	Complex (Cat. C)	Advanced (Cat. A)	Advanced (Cat. A)	Advanced (Cat. A)	Complex (Cat. C)

(圖3)



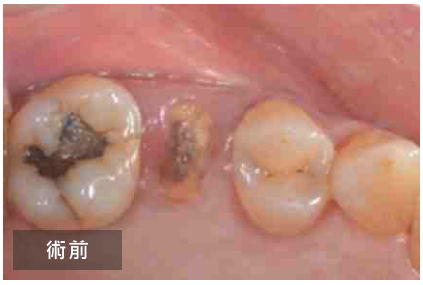
Characteristic bone resorption patterns. **(A)** A thin-wall phenotype showed a facial bone wall thickness of ≤ 1 mm and revealed a progressive bone resorption pattern after 8 wks of healing. **(B)** A thick-wall phenotype, with a facial bone wall thickness of > 1 mm, exhibited a less-pronounced bone resorption pattern after 8 wks of healing.

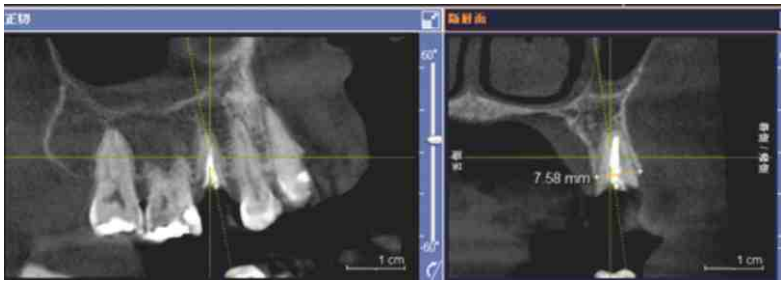
(圖4)

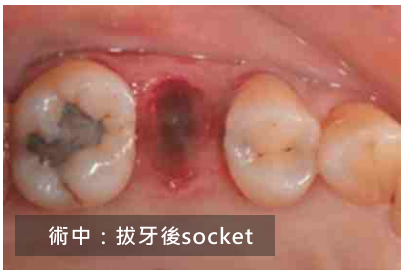


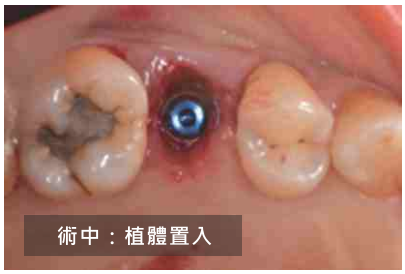
(圖5)

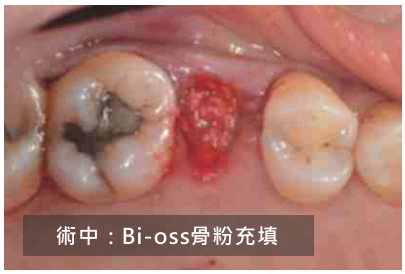
案例一



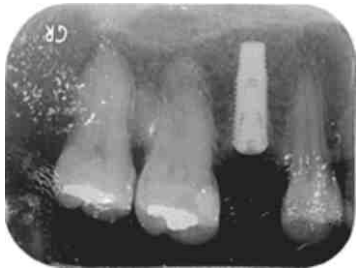


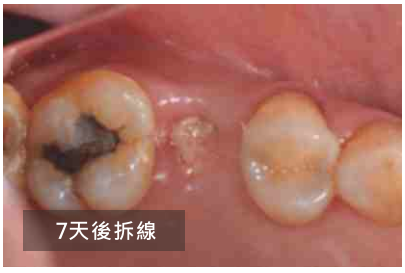

術中：拔牙後socket

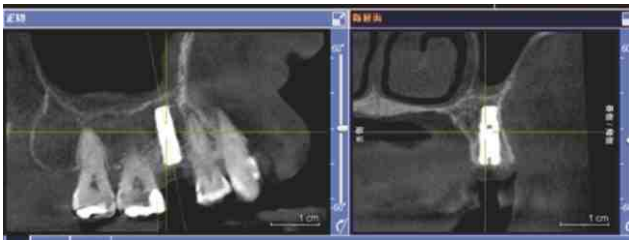

術中：植體置入


術中：Bi-oss骨粉充填

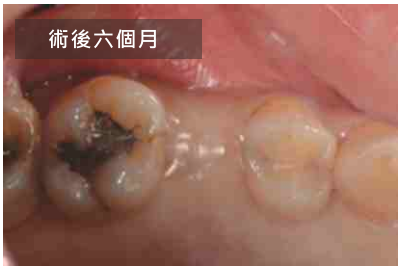

術中：collagen plug固定骨粉

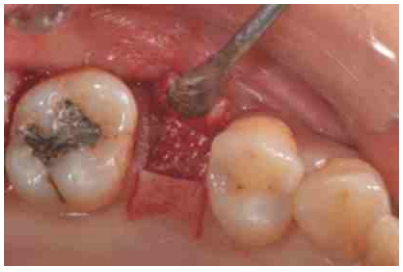



7天後拆線

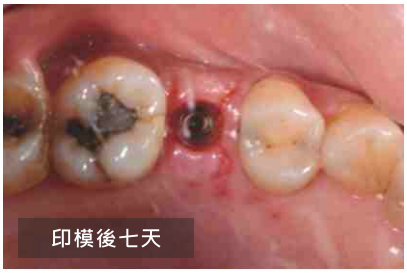


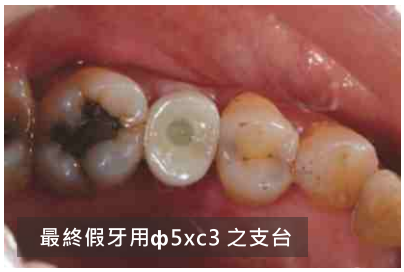
#15因骨頭條件許可做立即植牙。flapless extraction，並植入EZ 4x11.5 之植體，植體距buccal bone wall 2 mm以上，並用bi-oss做緻密充填，並用collagen plug做傷口的closure

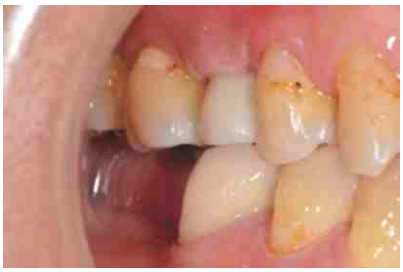

術後六個月

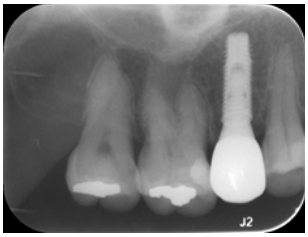



印模後接上φ5xc4 支台


印模後七天

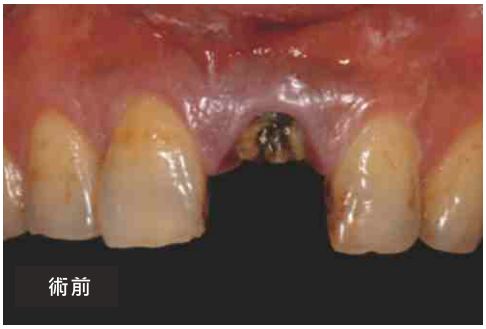

最終假牙用φ5xc3 之支台

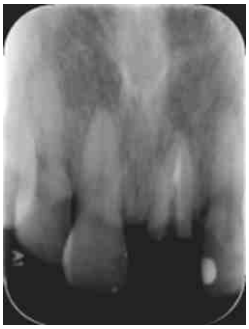


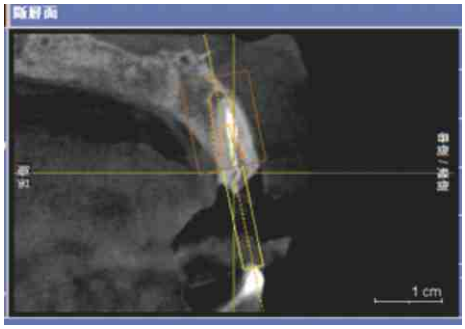


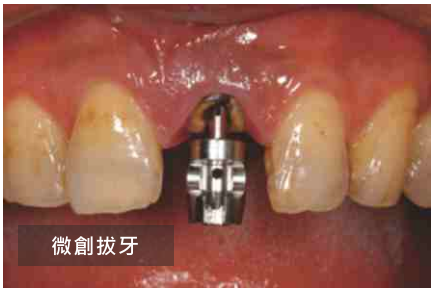
六個月後做二階手術，印模後接上φ5xc4 solid abutment 。於1週後試戴假牙，用φ5xc3之abutment，讓軟組織有buccal compression的效果

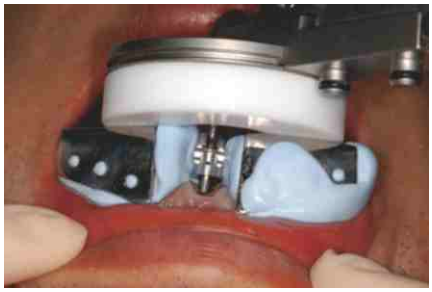
案例二

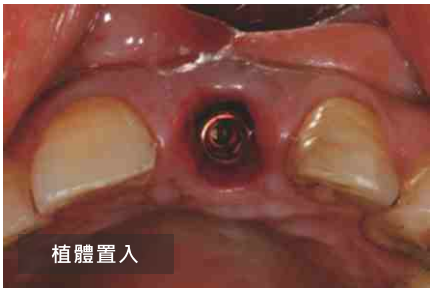

術前

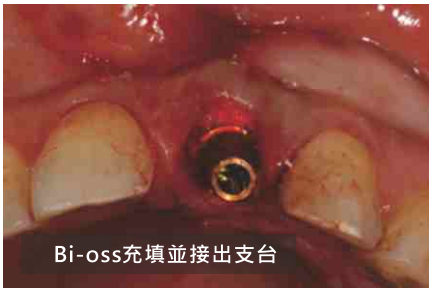


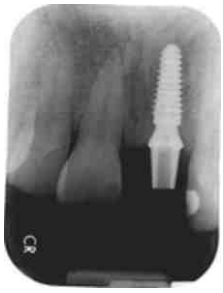

1 cm

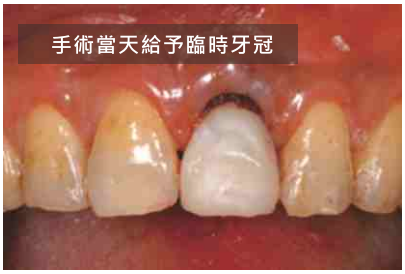

微創拔牙

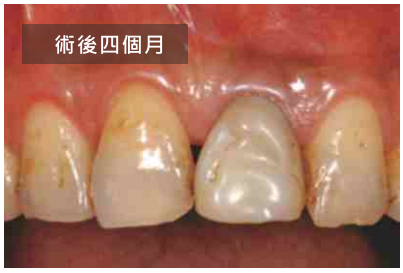



植體置入

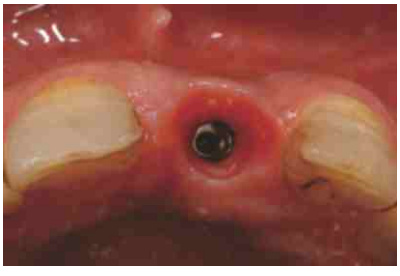

Bi-oss充填並接出支台

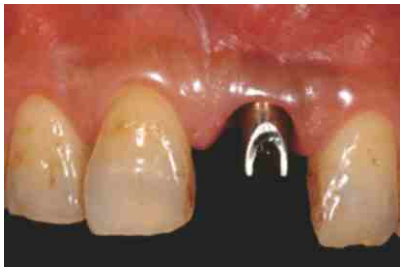


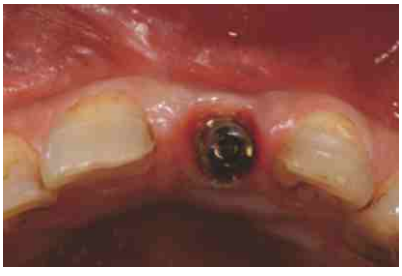

手術當天給予臨時牙冠

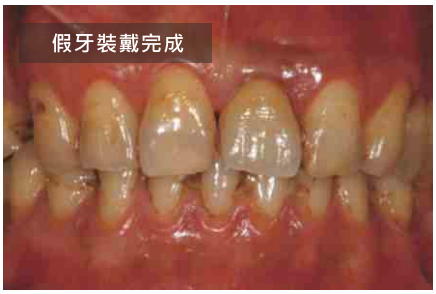

術後四個月

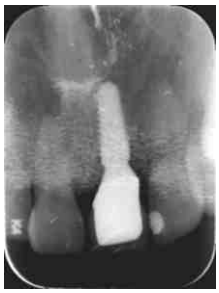

Customized transfer coping impression











#21屬於thin labial bone plate，立即植牙時，要特別留意植體距離buccal bone wall 2 mm以上，且在bone以下1~2 mm，並用骨粉做緻密的充填。因達35nt，當天接出φ5XC3XH5 abutment，給予Provisional crown，並且要under occlusion。四個月後二階印模時，用customized transfer coping之方法將軟組織型態複製在模型上。

討　論

根據軟、硬組織厚度的研究，大部份的前牙頰側軟、硬組織都是薄的，90%骨板小於1 mm[6]，且軟組織的平均厚度為0.5 mm[7]。若是按照Buser的建議去考量的話，大部份的前牙案例都不適合做立即植牙。另外值得注意的是頰側軟組織的厚度跟骨板厚度沒有一定的相關性[4,7]，意味著厚的軟組織未必有厚的硬組織

雖然在門牙區有極低的比例是屬於厚的骨板，但在第一小臼齒區確有相對高的比例27.5%是屬於厚的骨板[8]。筆者目前在前牙和小臼齒的拔牙處置上，都會先評估是否能做立即植牙。

在立即植牙中，根據Buser的建議(thick bone wall)有幾個觀念需注意[9]:

1.微創拔牙，避免傷及頰側骨板

2.Flapless procedure，減少頰側牙齦的萎縮

3.植體植入深度要低於頰側骨頭約1 mm(針對厚的骨頭預計會有1 mm的垂直吸收) P.S. 若為薄的頰側骨板則需要放在更深一點的位置，距牙齦5 mm是一個選擇

4.距離頰側骨頭要有2 mm的bony gap，並做紮實緻密的骨粉充填，以達軟硬組織的長期穩定。Ueli Grunder[10]也說明了頰側骨頭太於2 mm時，碟狀吸收不至於影響邊緣脊的高度造成不良的美觀，且足夠的骨頭厚度能提供頰側軟組織良好的血液供應。

在傷口的closure部份，可用rotary flap、connective tissue plug、collagen dressing，若達35nt的話可接出支台做closure。

最後，前牙區的立即植牙通常會伴隨1 mm的牙齦萎縮和軟組織水平寬度的減少，因此做CTG來代償此現象是不錯的選擇[11]

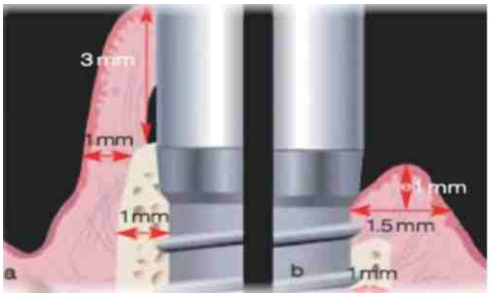
在牙冠復形上，後牙區在二階transfer close tray印模後先鎖上比final crown還要小的abutment讓軟組織有多餘的空間去癒合，一星期後試載時，軟組織尚未完全healing，此時鎖上假牙時，病人會有微微痛感，請病人咬棉卷慢慢咬緊放鬆，再慢慢咬緊放鬆，做tissue training約8分鐘，會有將軟組織做buccal position的效果。也算是Huan Su的一篇文章[12]裡頭的觀念的應用。至於在前牙美觀區部份的假牙製作，則會先在印模前2個月先將植體接出給予臨時假牙做軟組織塑型。Interdental papilla高度的部份可根據前輩們的研究(圖6)。前牙的軟組織主要取決於interdental bone height和labial bone(如前述，2 mm labial bone 會有較穩定的前牙美觀)

而在植牙周圍軟組織變化的研究來看[13]約在假牙戴上後3~6個月內會穩定(可安排半年回診觀察軟組織)，其寬比高約為1.5(圖7)，意為著橫向軟組織若不足，根據此比例，軟組織的垂直高度可能會萎縮，而為了建立biological width，也會伴隨骨頭的吸收。因此軟組織厚度若不足可考慮做CTG改善。

Table 2 Salama et al[12] classification of predicted height of interdental papillae

Class	Restorative environment	Proximity limitations	Vertical soft tissue limitations
1	Tooth-tooth	1.0 mm	5.0 mm
2	Tooth-pontic	N/A	6.5 mm
3	Pontic-pontic	N/A	6.0 mm
4	Tooth-implant	1.5 mm	4.5 mm
5	Implant-pontic	N/A	5.5 mm
6	Implant-implant	3.0 mm	3.5 mm

(圖6)



(圖7)

結　論

有別於過去可能會先做socket preservation，或是等待傷口癒合後再予以植牙。在現今立即植牙已可做為拔牙後的一種處置方式，其成功率和傳統植牙相當，在美觀上也能達到同等的效果，並可大大縮短病人的治療時間與次數，避免拔牙後時間過久造成巨大的軟、硬組織吸收。

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立即植牙之思考：Case reports

作者：高秉宏醫師

摘要：

針對前牙或小臼齒面臨拔牙時，植牙的方式和時機點，筆者給予分析與建議。並提供2個臨床案例予以說明：除了 delayed implantation 的植牙方式，在軟硬組織條件許可的情況下可立即植牙，無論成功率或美學結果，不亞於傳統的植牙方式，並可大大縮短病人治療時間及減少手術次數。

前言：

立即植牙需要考量 2 個部份：軟組織和硬組織。Salama 2007 年的立即植牙的分類裡頭[1] (圖1)，只要擁有足夠的bone for primary stability and ideal implant position，皆可考慮立即植牙。而在 Joseph Kan 的分類裡頭[2]，有 90% 左右的前牙骨頭型態 (class 1~class 3) 適合立即植牙 (圖2)。

Table 1 Classification of immediate implant placement 圖 1

Class	Buccal bone	Viable implant placement technique	Expected results of immediate implant placement	Indication for immediate implant placement
Class 1	Intact with thick gingival biotype	Immediate without flap reflection	Optimal	Yes
Class 2	Intact with thin gingival biotype	Immediate with CTG or staged CTG	Good	Yes
Class 3	Deficient but implant placement possible in remaining alveolar housing of extraction socket	Simultaneous immediate with GBR and CTG or followed by staged CTG	Acceptable	Limited
Class 4	Deficient and implant may deviate from alveolar housing	Delayed	Unacceptable	No

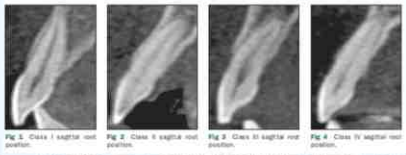


Fig 1 Class I sagittal root position. Fig 2 Class II sagittal root position. Fig 3 Class III sagittal root position. Fig 4 Class IV sagittal root position.

圖 2

但在 Buser 的分類裡頭[3] (圖3) 更直歇將頰側軟硬組織的厚度做個考量，將大於 1mm 的頰側骨頭且厚的 gingiva biotype 做為立即植牙的 indication。而小於 1mm 的骨板則建議拔牙後等待 4~8 週，待軟組織長好後再做植牙手術。根據 CBCT 的研究[4,5]觀察軟硬組織在拔牙後的變化，說明了大於 1mm 的骨板只有微量 (1 mm) 的垂直骨吸收 (圖4、5)，骨板在 8 週後幾乎還存在；但若是骨板厚度小於 1mm，在拔牙後的8週會有明顯的垂直骨吸收 (7.5 mm)，骨板幾乎會被吸收掉，取而代之的是增厚的軟組織(在植牙手術時，可以提供GBR時足夠的軟組織做 primary closure，避免 MGJ 的位置改變太多而需要再做 APF，甚至可以降低做 CTG 的可能性)。

不論要依據哪種分類，前提是需要確認手術區沒有急性的感染，且有足夠的骨頭提供 primary stability，且植體要在理想的位置上。

Table 2. Selection criteria and surgical aspects of each treatment option 圖 3

Terminology	Immediate implant placement	Early implant placement with soft tissue healing	Early implant placement with partial bone healing	Late implant placement	
Classification	Type I	Type II	Type III	Type IV with prior socket grafting for ridge preservation	Type IV without socket grafting for ridge preservation
Healing period prior to implant placement	None	4–8 weeks	12–16 weeks	4 months or longer	6 months or longer (often years)
Selection criteria	Intact facial bone wall with thick wall phenotype (> 1 mm). Thick soft tissue biotype. No acute infection in the socket. Sufficient bone volume apically to stabilize the implant in a correct 3D position	Thin or damaged facial bone wall. Sufficient bone volume apically to stabilize the implant in a correct 3D position	Large periapical bone lesion which does not allow type I or II placement	Adolescent patients eyes young for implant therapy (age < 20 years). Extended bone lesion apical and palatal to the root. Ankylosed root in apical position without bone volume apically to the root	Extended delay in implant placement post-extraction for patient or site-related reasons
Surgical aspects	Flapless approach whenever possible. Internal augmentation	Open flap procedure. Contour augmentation with guided bone regeneration	Open flap procedure. Contour augmentation with guided bone regeneration	Open flap procedure. Contour augmentation with guided bone regeneration	If sufficient bone volume, open flap procedure and contour augmentation with guided bone regeneration. If insufficient bone volume, staged bone augmentation, subsequent implant placement most often further grafting for contour augmentation
Difficulty level	Complex (Cat. C)	Advanced (Cat. I)	Advanced (Cat. A)	Advanced (Cat. A)	Complex (Cat. C)

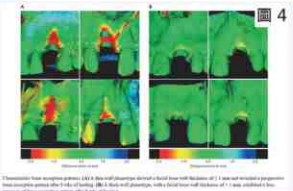


圖 4

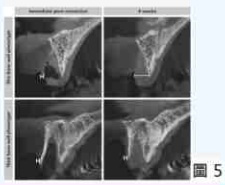
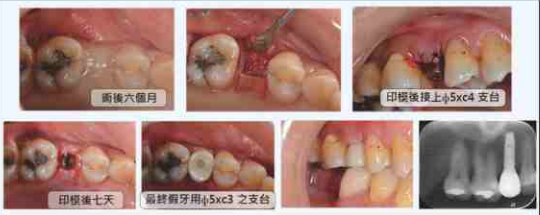


圖 5

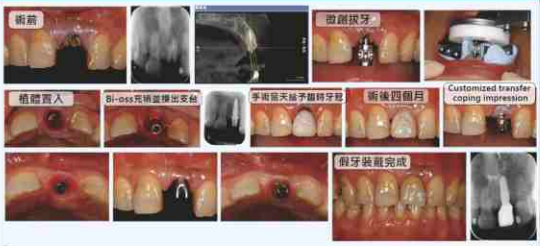
案例 1：

#15 因骨頭條件許可做立即植牙，flapless extraction，並植入EZ 4x11.5 之植體，植體距 buccal bone wall 2 mm以上，並用 bi-oss 做緻密充填，並用 collagen plug 做傷口的closure。



六個月後做二階手術，印模後接上 φ 5 x c4 solid abutment，於1週後試戴假牙，用 φ 5 x c3之 abutment，讓軟組織有 buccal compression 的效果。

案例 2：



#21 屬於 thin labial bone plate，立即植牙時，要特別留意植體距離 buccal bone wall 2 mm以上，且在bone以下 1~2 mm，並用骨粉做緻密的充填，固植35nt，當天接出 φ5XC3XH5 abutment，給予Provisional crown，並且要 under occlusion，四個月後二階印模時，用customized transfer coping之方法將軟組織型態複製在模型上。

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根據軟、硬組織厚度的研究，大部份的前牙頰側軟、硬組織都是薄的，90%骨板小於1 mm[6]，且軟組織的平均厚度為 0.5mm[7]，若是按照 Buser 的建議去考量的話，大部份的前牙案例都不適合做立即植牙，另外值得注意的是頰側軟組織的厚度跟骨板厚度沒有一定的相關性[4,7]，意味著厚的軟組織未必有厚的硬組織。

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在立即植牙中，根據Buser的建議(thick bone wall)有幾個觀念需注意[9]：

1. 微創拔牙，避免傷及頰側骨板。
2. Flapless procedure，減少頰側牙齦的萎縮。
3. 植體植入深度要低於頰側骨頭約 1 mm (針對厚的骨頭預計會有 1 mm 的垂直吸收) P.S.若為薄的頰側骨板則需要放在更深一點的位置，距牙齦5mm是一個選擇。
4. 距離頰側骨頭要有 2 mm的 bony gap，並做緊實緻密的骨粉充填，以達軟硬組織的長期穩定。Ueli Grunder[10]也說明了頰側骨頭大於 2 mm 時，碟狀吸收不至於影響邊緣骨的高度造成不良的美觀，且足夠的骨頭厚度能提供頰側軟組織良好的血液供應。

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而在植牙周圍軟組織變化的研究來看[13]約在假牙戴上後 3 ~ 6 個月內會穩定 (可安排半年回診觀察軟組織)，其寬比高約為 1.5 (圖7)，意為著橫向軟組織若不足，根據此比例，軟組織的垂直高度可能會萎縮，而為了建立 biological width，也會伴隨骨頭的吸收，因此軟組織厚度若不足可考慮做 CTG 改善。

Table 2 Salama et al[12] classification of predicted height of interdental papillae

Class	Restorative environment	Proximity limitations	Vertical soft tissue limitations
1	Tooth-tooth	1.0 mm	5.0 mm
2	Tooth-pontic	N/A	6.5 mm
3	Pontic-pontic	N/A	6.0 mm
4	Tooth-implant	1.5 mm	4.5 mm
5	Implant-pontic	N/A	5.5 mm
6	Implant-implant	3.0 mm	3.5 mm

圖 6

圖 7

結論：

有別於過去可能會先做socket preservation，或是等待傷口癒合後再予以植牙，在現今立即植牙已可做為拔牙後的一種處置方式，其成功率和傳統植牙相當，在美觀上也能達到同等的效果，並可大大縮短病人的治療時間與次數，避免拔牙後時間過久造成巨大的軟、硬組織吸收。

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