

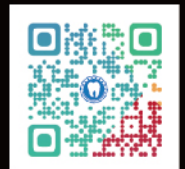


中華民國牙體復形學會雜誌

Journal of Taiwan Academy of Operative Dentistry (Taiwan AOD)

BIOMIMETIC DENTISTRY

仿生修復
牙醫學



中華民國牙體復形學會雜誌

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理事長的話

牙體復形學會雜誌的再進化

各位會員醫師好，牙體復形學會邁向第 26 個年頭。這兩年間，經歷了 COVID19 疫情的試煉。感恩大家都以智慧與健康走過這段漫漫長路，也有更多的應變經驗面對未來更多的挑戰。

衛福部於 2018 年 10 月 5 日公布牙醫專科醫師分科及甄審辦法，這是牙醫界在口腔顎面外科成為部定專科 20 年後的大變革。牙體復形學會於 2019 年開始提出申請，經過兩年多，衛福部於 2021 年 7 月 2 日公告「牙體復形科專科醫師甄審原則」、「牙體復形科專科醫師訓練機構認定基準」、「牙體復形科專科醫師訓練課程基準」，由牙體復形學會承接專科醫師甄審。這不僅是台灣牙醫界的重大變革，也是學會的新挑戰。相較於其他學會，牙體復形學會的規模雖小，但承擔著台灣牙體復形、美容牙科醫學、牙科材料學等教學臨床發展，不僅要培育專科醫師人才，更需兼顧由大學部 (undergraduate) 與 PGY 的一般牙科醫師訓練，重要性不言而喻。

為著這個使命，學會幹部一直以來努力提升我們的品牌價值。學會會訊也一直以臨床與學術兼具為目標。本年度的會訊中，力邀王法仁醫師分享“暫時填補充填材在嵌體與冠蓋體的應用”，這是臨床進行嵌體與冠蓋體必須克服的問題。市立醫院張玉麒主任分享“金屬冠蓋體完成根管治療後近心傾斜大白齒復形”，成大醫院連盟家醫師分享“使用間接複合樹脂冠蓋體做為大量齲蝕白齒的過渡 - 永久性治療：病例報告”，由此可見嵌體與冠蓋體等間接復形物將變成未來臨床治療主流。台大劉曉暘醫師的“數位牙科設計軟體輔助在矯正牙齒療程以複合樹脂直接填補釘狀齒之應用”病例報告中，則併入數位牙體設計的應用。最後誠摯感謝編輯主委也是主編郭文傑醫師撰寫“Book Review of Biomimetic Restorative Dentistry”，詳盡的撰寫摘要了 Pascal Magne & Urs Belser 所撰寫的 Biomimetic Restorative Dentistry 這本經典教科書的重點、五大關鍵章節 (自然的口

腔設計、治療計畫的擬定與執行、直接修復技巧傳授 (CAD/CAM 應用)、前牙美學修復技巧 (Veneer 貼片)、維護與修補) 等清楚陳述，造福重大學子與臨床醫師！這篇文章絕對列為必讀，不論是入門牙科美學，或是專科醫師，都可以從中學習基礎與技巧。由衷佩服郭主委的熱誠與深厚功力！

除此之外，學會也以規劃精彩學術活動，辦好演講、辦”好演講”的態度，緊扣保存學的要旨，講師的陣容與主題也涵蓋深度與廣度。今年我們在疫情衝擊下所辦理夏季研討會”美，沒有極限”；年會推出”以終為始，保存想要的牙齒”學術演講，都具有深刻意涵。也帶給會員醫師，以及國內所

有熱愛牙體復形學與審美牙科的醫師學術饗宴，讓大家實在感受學會的用心！學會明年也將承辦 Cons Asia 2023 會議，這是擴大到亞太地區的保存牙醫學盛大國際會議，由陳敏慧顧問擔任主席，相信會讓大家耳目一新，感受牙體復形學會走向國際舞台的決心！牙體復形學會邁向新的部定專科里程碑，希望擴大”小學會”的角色，成為台灣牙醫界重要的棟樑！



中華民國牙體復形學會
Taiwan Academy of Operative Dentistry (Taiwan AOD)

理事長 莊淑芬 敬上

編輯序

2022 年是一個充滿挑戰一年，新冠病毒的肆虐改變了所有人的生活，看診治療都變得較為困難複雜，所幸隨著疫苗問世大家的防疫管控概念落實，讓許多危機慢慢降低而化解。學會雜誌承蒙各位醫師的投稿得以增色不少，美學修復大師 Pascal Magne 與 Urs Belser 合著的新書 *Biomimetic Restorative Dentistry* 已成為大家臨床工作的參考指引，隨著材料進步與觀念改變，治療的選擇也變多了，但許多基本功還是不變，對於型態的掌握，美學設計的要點，數位輔助評估到臨床驗證落實，每個步驟與細節都是關鍵。唯有一步一腳印，才能成就完美穩定極致的治療。防疫工作與復形治療有異曲同工之妙。當我們手上的武器變多時，自然就能面對更多的挑戰。

本期雜誌同樣有三篇精彩的案例分享，內容實用性高並且利用軟體來輔助設計，讓患者技師們更了解醫師的想法與目標，此外，本期大仁哥教室分享的是有關間接復形物治療時，臨時充填物的材料操作性比較，使用經驗分享與材料特性說明相互呼應，是一篇值得了解細讀的好文章。

歲末將至，新的一年期待明天會更好，相信在眾人的努力下，烏雲總有撥天見日之時，在此拜個早年，祝福大家新年快樂平安吉祥。



中華民國牙體復形學會
Taiwan Academy of Operative Dentistry (Taiwan AOD)

雜誌暨出版主委 郭文傑 敬上

大仁哥的臨床教室 (2022)

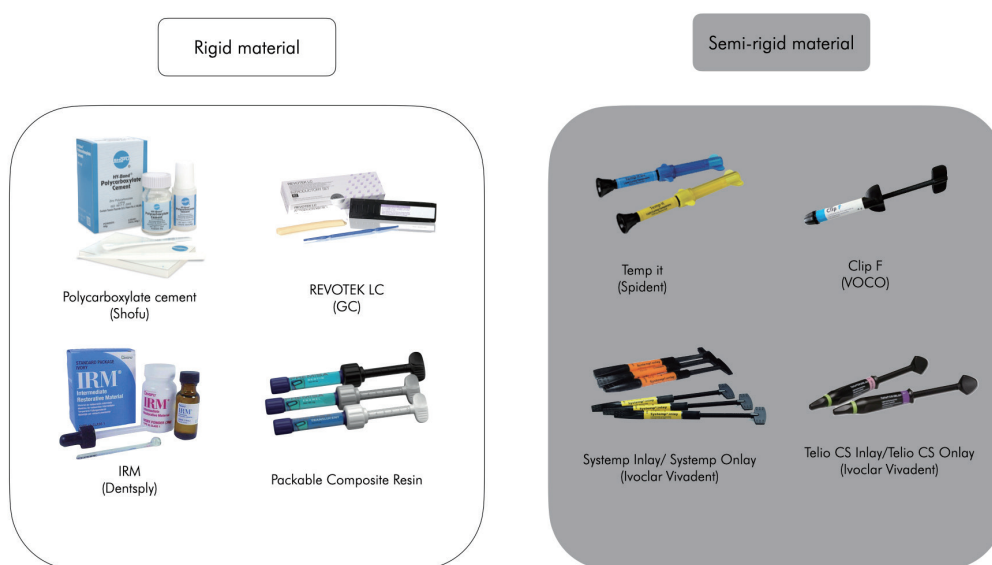
Temporary filling material in inlay/onlay restoration

暫時填補充填材在嵌體與冠蓋體的應用

鄭至為¹ 姜昱至² 王法仁^{1,3*}

一、臨時材料的種類

在 inlay/onlay 製作過程中，使用的臨時材料依照聚合後的性質大致上分為兩大類：rigid material 及 semi-rigid material，筆者列出目前在台灣能取得的一些臨時材料（圖一）：



圖一

二、臨時材料的性質比較

在臨床上選擇，主要依照缺損範圍大小及深度，還有合作技師的習慣、病人約診時間去做選擇。臨時材料能盡量不脫落為最重要的考量，因臨時材料能夠越穩定，後續嵌體 try-in 的調整會更容易，基本原則是材料較硬、窩洞範圍越小的情況下，臨時材料越不易脫落；材料越軟、窩洞越大，臨時材料則越容易脫落。故就材料而言兩者在臨床上主要差異如下表（表一）：

¹ 臺大牙醫學系學士、臺大醫院總院住院醫師、中華民國牙體復形學會會員、臺大一般牙科專科訓練結訓

² 臺灣大學牙醫專業學院牙醫系副教授、臺大醫院牙體復形美容牙科主治醫師

³ 臺灣大學臨床牙醫學研究所碩士、中華民國牙體復形學會專科醫師、美國西雅圖華盛頓大學假牙美學及植牙研究、美國 TUFTS 牙科睡眠醫學研究、台灣植牙骨整合醫學會會員、美國美容牙醫學會會員（AACD）

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	Rigid material	Semi-rigid material
臨床操作速度	較慢	較快
脫落機率	較不易脫落	較易脫落
鄰牙位置	較穩定	可能會造成鄰牙位置改變
移除後 margin 完整度	可能會傷害到 margin	較不易傷害 margin
邊緣封閉性	較佳	較差

表一

● 臨床操作速度

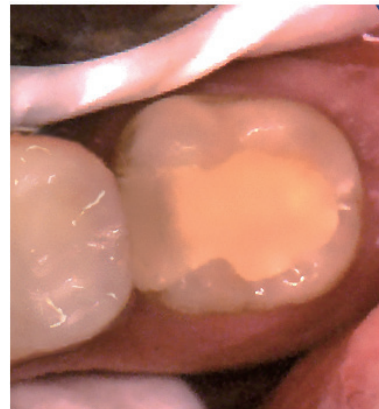
Rigid material 在臨床操作上，通常花費時間較 semi-rigid material 來得長，因這類材料，通常需要經過調拌，或是材料本身需做一些修磨調整，再使用黏著劑黏著，相對操作較繁複。而 semi-rigid material 通常僅需要將材料壓到窩洞上、adapt 好，請病人咬起來做光聚合就完成了，臨床上操作較為簡易快速。

● 脫落機率

Rigid material 通常較不容易脫落，因此在比較沒有 retention form 的窩洞，像是範圍較大的 onlay、overlay 就比較適合；而 semi-rigid 這類的材料因光聚合後仍具有彈性，若在比較沒有 retention form 的牙齒上，時常會有脫落的情況，要避免脫落可在遠離 margin 處的牙齒表面做小範圍的 bonding。因此若在範圍較大的窩洞、技師製作復形物時間較長或是病人時間較難配合，約診間隔較久的情況，建議使用 rigid 類的材料會比較穩定。

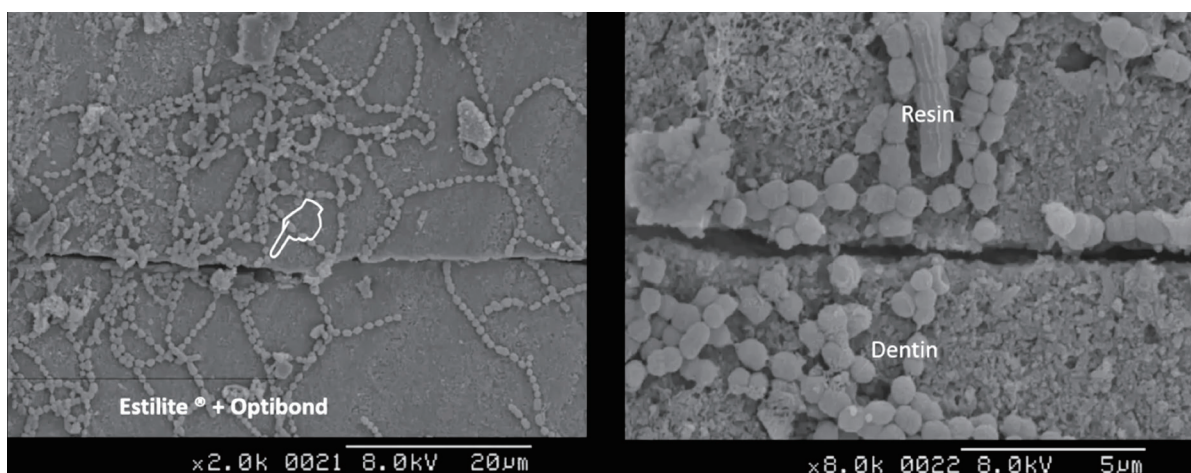
● 鄰牙位置

Rigid 材料，因質地較堅硬沒有彈性，承受咬合力時形變量較小，較不會對鄰牙位置產生影響。而 Semi-rigid



圖二：Semi-rigid 材料受咬合力時會變形，導致有推擠鄰牙的力量（照片截自 VOCO Clip-F 說明書）

material 因光固化後具有彈性，在病患咀嚼承受咬合力時，會對鄰牙造成推擠力，產生類似矯正的作用，造成鄰牙距離變遠，因此若臨時材料都沒有脫落的狀況下，試戴嵌體時可能會發現有 open contact 的狀況。筆者臨床經驗上，在上顎後牙區較容易發生此情形，雖然可能嵌體黏著完一兩週後，臨接面接觸點會恢復正常。但若合作技師的品質不穩定，遇到臨接面 open contact 的狀況，可能會無法確定最後是否會恢復鄰接面接觸。因此，筆者建議若合作技師的品質比較不穩定，最好都使用 rigid 材料，臨床結果會比較可預測。但若使用 semi-rigid 材料真的在黏著當天發生 open



圖三

contact 的狀況，若該 open contact 側的鄰牙鄰接面是有填補過的，則直接黏著嵌體是比較沒問題的，因後續回診若還是 open contact，可將鄰牙樹脂重新填補以重新建立臨接面接觸即可。(圖二)

● 移除後 margin 完整度

Rigid 材料，因材料較硬，移除過程常會使用洗牙機頭去做清潔，但洗牙機頭若碰到 margin 附近的 enamel，時常發生細微的 enamel chipping，margin 完整性會受到破壞，尤其是使用 polycarboxylate cement (PCC) 這類的材料作為臨時材料時，因 PCC 中的羧酸基會與牙齒中的鈣產生 bonding，因此移除時很可能會傷害到 margin 的 enamel。因此，建議在使用 rigid material 作為臨時材料前，可先在牙齒邊緣 margin 處，使用小毛刷沾凡士林塗抹以保護 margin，較不會有移除後破壞到 margin 的問題。

semi-rigid 的材料對牙齒沒有與牙齒產生 chemical bond 的效果，因此移除時，margin 完整度比較不會受影響，僅

有前次為避免脫落而做的 bonding 處移除較困難，還有若有以 composite resin 當基底材時，清潔上可能要多加注意，需使用噴砂清潔。因此若要塗抹 bonding，建議做在遠離 margin 的位置，塗抹範圍也不要太大。

● 邊緣封閉性

邊緣封閉性的影響，主要是看操作者是否有做 IDS 的習慣。台大醫院姜昱至教授團隊對於 IDS 的研究發現，因 bonding 的介面對細菌的抵抗力較差，暴露在口水中一週後發現，bonding 介面會較容易被降解，且複合樹脂容易招致細菌附著，dentin 跟樹脂介面就會不穩定，對後續復形物強度可能會產生影響。(圖三)

Rigid 材料，大部分的邊緣封閉性相對較佳，因承受咬合力時形變量較小，邊緣較不會產生縫隙，且像 PCC 類材料會與牙齒表面產生 bonding，因此封閉性更佳。



圖四



圖五



圖六

Semi-rigid 材料因有彈性，受咬合力時形變量較大，易產生邊緣滲漏，邊緣封閉性差，牙齒介面易生成牙菌斑，因此黏著前更需仔細噴砂清潔去除牙菌斑，尤其是附著在複合樹脂的牙菌斑。

三、臨床操作步驟簡介

● Rigid material

PCC/IRM:

單純使用 PCC 或 IRM 作為臨時材料，兩者操作方式相似：首先牙齒 margin 先用小毛刷塗抹凡士林，鄰接面放 wedge，讓病患可以用牙間刷清潔。而 PCC 需調得較稠，類似 caviton 的硬度，adapt 到 cavity 上；IRM 則是照比例調拌，adapt 到 cavity 上，若是比較沒有 retention form 的窩洞，可以將材料蓋過 buccal/lingual(palatal) embrasure，較不容易脫落。IRM 由於含有 eugenol，對 dentin 的 bonding 可能會產生影響，因此在嵌體黏著前的臨時材料是比較不建議使用 IRM。

REVOTEK LC:

光聚合的材料，聚合前性質有點類似 dough stage 的 PMMA，但聚合後較沒有彈性，因此操作方式類似做牙冠的臨時假牙，但建議鄰接面需放 wedge。adapt 上去 cavity 之後，將多餘材料移除，請病患咬起來，light curing。curing 完使用 crown remover 敲下，邊緣修順、咬合調整完，牙齒表面塗抹凡士林，最後使用臨時的樹脂黏著劑 (ex. Systemp. Link) 進行黏著，這個做法雖需花的臨床時間較長，但邊緣的密合度是最高的，病患也較容易清潔，黏著時可有良好的牙齦健康度，因此在窩洞邊緣較深的狀況下，可以考慮使用此做法。

Packable composite resin+PCC:

此做法是台大姜昱至教授教導給住院醫師的方式，也是筆者最常使用的方式。(photo courtesy of Dr. 王法仁)

1. 首先窩洞 margin 先塗少量凡士林，調拌 PCC，使用小毛刷先 adapt 到窩洞

中(若窩洞 margin 較深可先在鄰接面放 wedge, 讓病人回去可以用牙間刷清潔)(圖四)。

2. 將 packable 樹脂 adapt 到窩洞, 使用的樹脂盡量是光聚合前質地較硬的, 在操作時會較容易(筆者常用是即期的 Kerr Premisa、Ivoclar Tetric-n Ceram 及 GC SOLARE Sculpt), 若是 retention form 較佳的窩洞, 像是圖片案例中的情況, 可不用把 packable 樹脂壓到 box 最深處, 之後較容易移除。若將樹脂壓到 box 深處也沒關係, 下次約診要移除時, 可以使用 high/ low speed 進行移除 packable resin, 當看到白色 PCC 時就要小心避免破壞齒質, 因此 PCC 的好處可以降低術後敏感同時又能當明顯的介質(圖五)。
3. 移除多餘樹脂
4. 請病患咬合, 並 light curing, 最後再使用洗牙機移除多餘溢出的 PCC, 最後移除咬合干擾。(對咬牙可以塗凡士林避免咬合後沾黏起 packable resin)(圖六)。

● Semi-rigid material:

這類材料性質類似, 有含氟的材料 (VOCO ClipF、IV Telio CS in/onlay) 因抗菌能力較佳, 使用在深部窩洞的牙齦健康度會較佳。而 Ivoclar 的產品 Telio CS in/onlay 兩者差別在硬度, Telio CS onlay 較硬, 適用範圍較大的窩洞, Telio CS inlay 較軟, 較有彈性, 適用範圍小的窩洞。

操作上, 可先塞 wedge 讓病患可用牙間刷清潔, 若是沒有 retention form 的牙齒, 可將材料包覆超過鄰牙 buccal/lingual (palatal) embrasure, 或是可以在遠離牙齒 margin 處進行 bonding(塗抹範圍不用太大)、light curing, 之後 adapt 材料到窩洞上, 因材料性質較易黏器械, 可將器械沾凡士林再操作, 或是手套稍微沾些病患唾液直接用手去 adapt 及塑形, 再請病患咬合後 light curing。因材料較容易掉, 故咬合調整的部分, 盡量將 lateral movement 時修到無接觸, 並請病人這段時間盡量不去咬該側牙齒, 比較不會發生脫落的情況。

討 論

筆者使用 Packable composite resin+PCC 的好處有：

- 1.PCC 能有效降低敏感。
2. 照光時利用 PCC 未乾能補償複合樹脂收縮時所造成的不適感。
3. 材料便宜取得容易。
- 4.PCC 能與鈣形成 bonding 使 packable composite resin 不容易脫落，比起 Semi-rigid material 有較佳的固持力。
5. 移除 Packable composite resin 時，因為有 PCC 的存在，而不用擔心傷到齒質。
6. 臨床時間有限時，五分鐘內即可完成所有步驟。

結 語

in/onlay 的臨時材料選擇依據關係到許多考量，需依據窩洞大小及深度、窩洞設計、取模到黏著前的時間長短等因素，因臨時材料對於牙齒位置的穩定非常重要，因此不論使用哪種材料，都需告知病人小心使用，且若臨時材料掉必須盡快回診處理，才不會在黏著嵌體的過程中造成不必要的影響。

Book Review 教科書書本回顧
Biomimetic Restorative Dentistry 2021
Pascal Magne & Urs Belser

郭文傑^{1*}

這是一本 2021 年出版的仿生修復鉅作，是由當代美學修復專家 Pascal Magne 和 Urs Belser 兩位來自瑞士的教授所合著，書本的內容相當豐富充實內容涵蓋牙齒形態學、修復考量、材料選擇與臨床案例製作分享，每個部分的細節輔以短片來延伸介紹，可稱為牙科修復學的百寶箱。

本書的首章節，就將 Biomimetic Restorative Dentistry 的原則與四個重要參數 (Biology, Mechanical, Function, Esthetics) 的平衡和諧所達成的結果。並且在四個重要的元素下 (Science, Experience, Common Sense, the Patient)，逐步實現與完成。每個案例都是獨一無二，透過我們的知識與科學分析，憑藉著經臨床驗累積與執行，還有對治療的熱情、信念與執著，尊重並配合患者的決定與喜好來達成所謂的仿生治療。當然形態結構與功能受力息息相關，如果沒有好的設計與修復材料選擇（請見圖二），最終結果將不盡理想。

本書的章節大致可區分為五個主題：

一、自然的口腔設計（解剖型態介紹與牙齒描繪練習）

二、治療計畫的擬定與執行（超保守微創修復與美學考量）

三、直接修復技巧傳授 (CAD/CAM 應用)

四、前牙美學修復技巧 (Veneer 貼片)

五、維護與修補（治療後的危機處理）

以下針對五大主題做重點摘錄將分別作短述與評論，預知詳細內容還請讀者自行添購書本自行參閱已獲得最佳完整的論述。

一、自然的口腔設計

此主題章節是最基礎也是最需要練習的一部分，必須先了解自然牙齒的形態構造與運作，才能對後續治療有完整的概念想法，構成美觀的基本條件總共有 13 項，其中 9 項與牙齒有關，有 5 項與軟組織和諧有關（請見

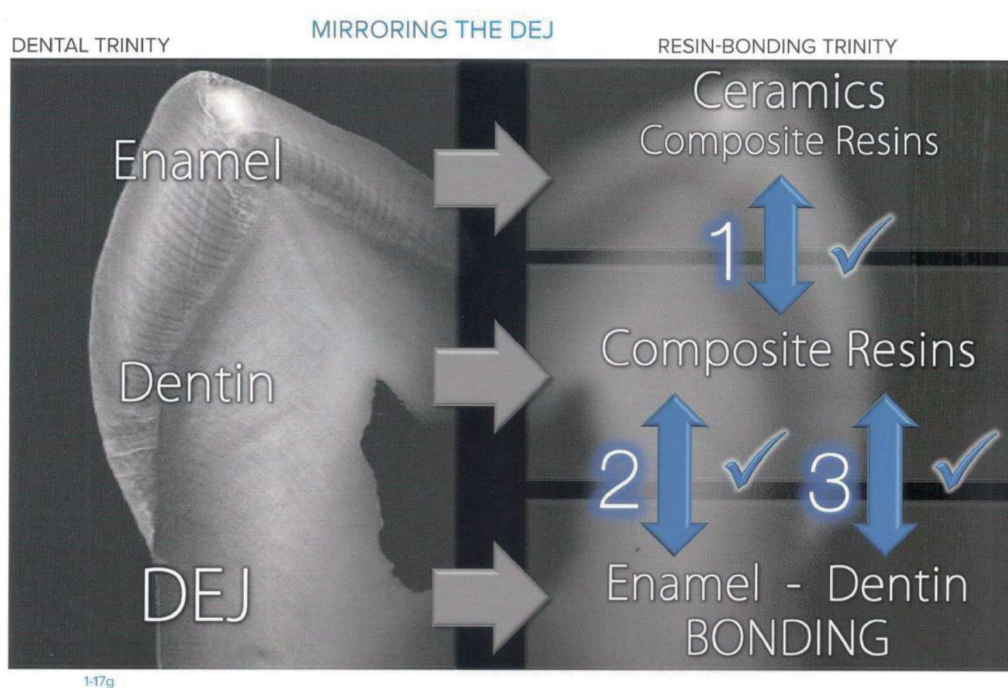
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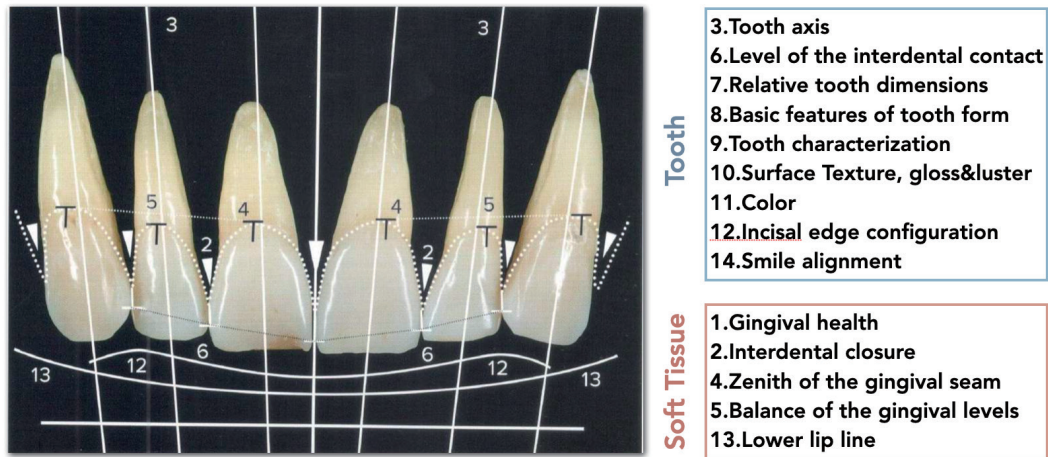


圖一：忠實模擬自然牙是仿生的最高境界亦無變色的情形。



圖二：The “trinity” of resin bonding 三位一體的概念

Fundamental objective criteria



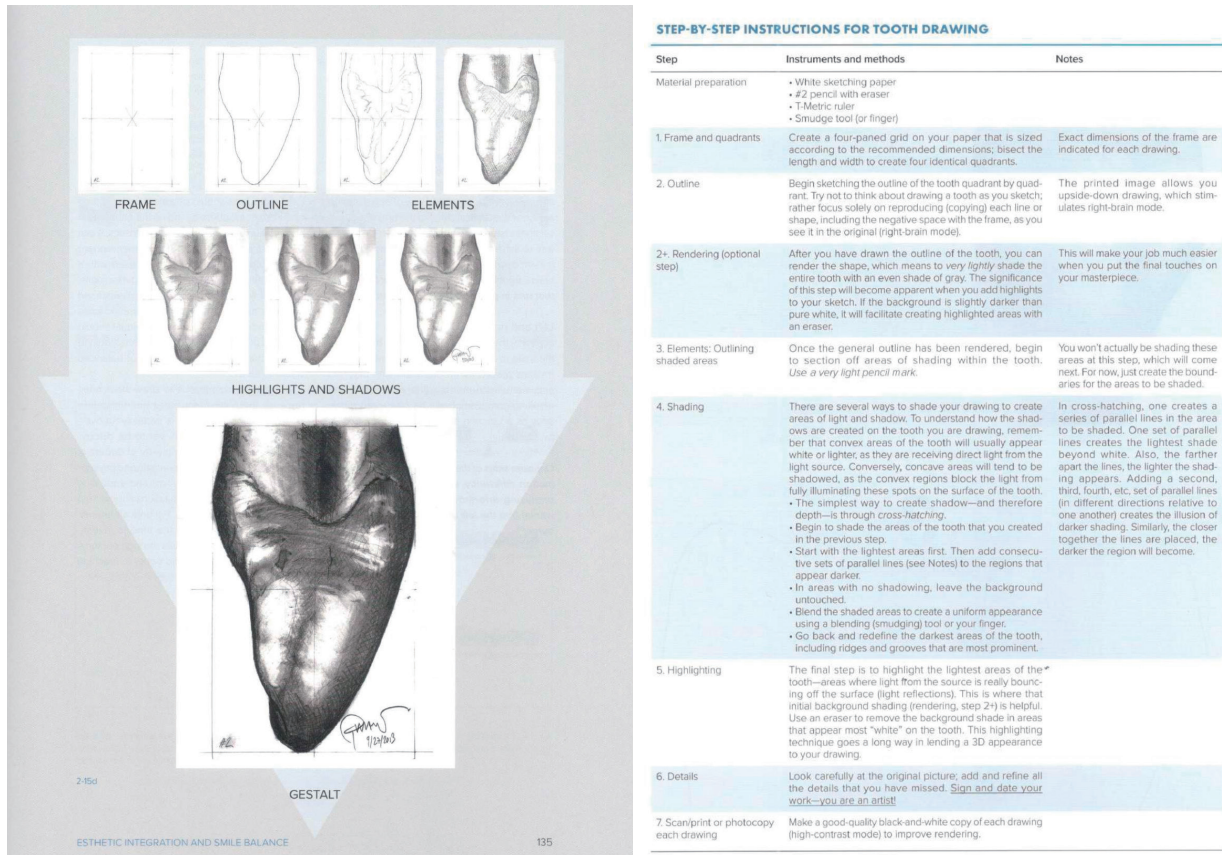
圖三：基本的審美標準

圖三)，另外還有加上牙齒外型、排列、牙冠長度與空間做整體考量，每個項目與細節充分說明。對於臨床醫師評估診斷相當實用，也有助於解決美學難題。透過描繪練習（請見圖四）可以加強對型態的感知能力，了解型態解剖構造，由點 - 線 - 面到立體成型，每個牙齒具有其獨特性與特質，近 100 頁的圖說和介紹相當精彩，各位讀者千萬不要跳過，這對型態與咬合功能重建有相當大的助益，尤其在 wax-up 和 mock-up 製程時幫助很大。

二、治療計畫的擬定與執行

在治療計畫的制定前必須先有好的診斷與評估，本書分成兩個部分來做說明，先介紹齒質破壞較少與牙齒變色問題的超保守性治療。如何保留完整組織是仿生治療的最大原則。減少破壞更勝於重建治療。因此從夜間美白牙托到齒內漂白，利用藥劑將牙齒顏色的改善讓整體更顯明亮。牙釉質表面質地不佳利用噴砂去斑到修整再礦化樹脂浸

潤，透過保守性治療達到微創修復（請見圖五）。許多創傷牙齒會因牙髓壞死而變色，導致外觀不佳但結構良好。此時，透過幾次的齒內漂白便脫胎換骨以嶄新容貌重現光澤。另外局部較小範圍的牙齒斷片，也可透過複合樹脂與黏著系統來重新接合，若是界線明顯可於頰側面覆蓋一層樹脂來美化，效果一樣顯著神奇。隨著黏著系統的演進與材料技術提昇，前牙的直接修復已經達到栩栩如生的效果，漸層堆築與構色搭配理想的修整拋光工具，讓最終成果令人滿意。齒縫關閉與後牙鄰接面重建，透過良好的 matrix system 與 sandwich techniques（請見圖六），也可以達到緊密的接觸面。另外，針對較深的後牙鄰接面，可以考慮採用 DME (Deep Margin Elevation) 方式，在良好的隔濕 (isolation) 下將復形物的邊緣 (margin) 上移，最重要的是必須以 bitewing film X-ray，來確認沒有過多的材料或縫隙，才能確保不影響牙周組織的健康。臨床上是保守治療可考慮採用的方式。



圖四：五種基本感知能力 Five fundamental perceptual skills ~ 框架、輪廓、元素、明暗、完成

TABLE 3-1 Ultraconservative approaches to white enamel defects and their indications

Clinical situation	Microabrasion ²⁹	Bleaching ⁶	Megabrasion ^{19,31}	Resin infiltration ³⁴
Deminerallization, early caries lesions	Yes [†]	Yes ^{††}	No	Yes
Mild fluorosis, white and brown	Yes [†]	Yes	No	Yes [*]
Mild fluorosis, white	Yes [†]	Yes	No	Yes [*]
Developmental defects, white and brown spots, and surface defects	No	Yes [‡]	Yes	Yes [‡]
Developmental defects, white and brown spots	No	Yes [‡]	Yes	Yes [‡]
Developmental defects, white spots	No	Yes ^{**}	Yes	Yes ^{‡†}

[†]Indicated only prior to remineralization.³³

^{**}Indicated only to improve shade after microabrasion/remineralization.

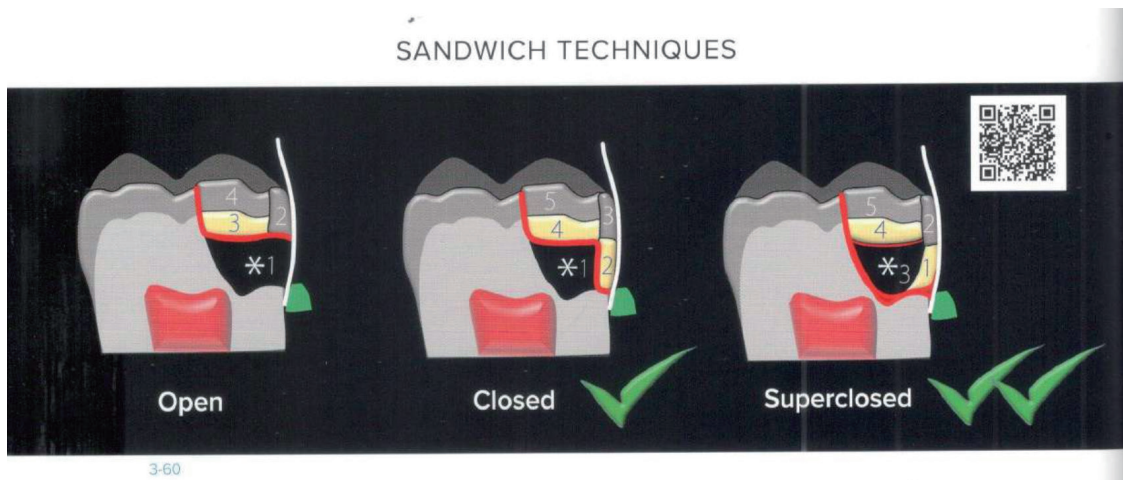
^{††}Indicated only when preliminary bleaching does not provide a satisfactory result.

^{*}Does not remove white spots but may lighten the background enough to be acceptable.

[‡]Preliminary bleaching to eliminate yellow-brown discolorations prior to megabrasion (deep lesions).

^{‡†}In combination with megabrasion (deep lesions).

圖五：Ultraconservative approaches to white enamel defect



圖六：Sandwich Techniques 三明治堆疊技巧

如果患者的需求是必須考慮整體美觀考量微笑重建，或是較嚴重的腐蝕 (biocorrosion)、磨損 (wear)，必須透過治療計畫擬定、診斷模型與患者充分溝通，並且要讓技師知道並執行，利用 wax-up & acrylic mock-up，達到最終理想成果，醫師、技師和患者需共同努力。PSD (Photoshop Smile Design) 是利用電腦軟體來模擬改善患者問題的工具，可以增強治療動機或說明手術、矯正等治療的必要性。前牙美學中牙齦的高度與和諧對稱性相當重要，透過牙齦整型手術，不僅可以改善牙齒比例，避免齒縫黑三角與乳突喪失，牙齦萎縮改善與增厚也成為關鍵。

牙齒經過長時間的使用與耗損，牙釉質耗盡磨損，短、薄、凹陷是垂直高度喪失的結果。本書介紹 wax-up 細節與 diagnostic mock-up 的步驟，詳細且實用，筆者實際應用也能做出令人滿意的結果，三種不同目的的 silicone index:

- ① Incisal Clearance：確認牙齒切端長度
- ② Labial Clearance：確認頰側面牙齒修磨量足夠
- ③ Mock-up：口內模擬最終成果與外型，可用來製作臨時貼片

透過多次的反覆討論與驗證，獲得患者的同意與理解後，才能進行下一個階段的修磨工作。咬合提高的案例多半較複雜，必須透過臨時假牙試戴來適應，治療完成最終需要給予咬合板避免損壞。當然與技師溝通最重要的就是拍照攝影，比色驗證與溝通紀錄必須要和技工所同步才能減少誤差，偏光鏡的搭配使用能將質地細節表現得更出色。

三、直接修復技巧傳授 (CAD/CAM 應用)

直接修復材料的進步與 CAD/CAM 的改善，讓假牙一日完成不再是夢想，後牙的缺

TABLE 4-3 Essential steps for successful IDS and their purpose

Step	Purpose
1. GIC barrier onto root canals (for ETT only)	Prevents formation of contaminants due to dissolution of endodontic sealer by solvents in dentin adhesive primer.
2. Freshly cut dentin	Cleans the dentin surface and increases surface area (rough diamond); for total-etch adhesives only. Use carbide bur for self-etch adhesives.
3. Apply filled dentin adhesive	Seals all exposed dentin with a consistent layer of adhesive resin (no air-thinning). A flowable liner should be applied on unfilled adhesives or when polyether impression materials are used.
4. Apply composite resin base (if needed)	Improves preparation geometry, fills undercuts, and reinforces remaining cusps, possibly elevating subgingival margins.
5. Apply glycerin and polymerize ("air blocking")	Minimizes the thickness of the oxygen-inhibited layer.
6. Refinish enamel margins	Eliminates excess adhesive resin and removes enamel undercuts. Use oscillating tips for interdental margins.
7. Pumice tooth preparation (not needed with optical impressions)	Eliminates debris and residues of oxygen inhibition and prevents interaction with PVS impression materials.
8. Final impression	Facilitates fabrication of the restoration, preferably polyvinyl siloxane (polyethers show adherences to IDS unless bio-base is applied).
9. Isolate preparation before provisionalization	Avoids adherence and locking of the provisional restoration.
10. Air-abrade preparation before luting restoration	Removes debris and cleans the IDS surface for optimal resin-to-resin bonding with the luting agent.

圖七：達到成功 Immediate dentin sealing(IDS) 的十個重要步驟

損重建修復也不再是以全覆蓋的牙冠來做選擇，Inlay/Onlay/Overlay 成為微創治療的首選。不僅保留較多齒質，也因為科技與材料的進步，更加精密耐用。裂齒症或是深度齲齒案例，也可以透過 IDS(Immediate Dentin Sealing) 來將牙髓做適當保護形成生物基底層 (Bio-base)，重要的十個步驟 (請見圖七)。作者還提出 20 個以上的理由要做 IDS(請見圖八)，包括 bonding 在 freshly dentin、prepolymerization thickness and stable hybrid layer、select wet bonding、delay loading of the dentin bond、decreased bacteria leakage、decrease postoperative sensitivity、improved tooth preparation & restoration adaption、reinforcement of remaining tooth structure、tissue conservation、strengthening effect on ceramic crown, onlays, and veneers、facilitated try-in procedure、optimal protection of direct pulp capping、sealing of endodontically

treated teeth (ETT)、contingency to the DME technique、2-stage placement of direct composite resin restoration、protection of root surfaces and biocorroded dentin。依據作者的經驗可以協助改善一些臨床症狀建立較好的治療品質與結果。

拜數位科技之賜，透過掃描鄰近牙齒的型態來重建缺損牙的型態。並且能在電腦上完成設計、精準咬合，讓臨床調整所需的工作時間降至最低。根管治療後的牙齒也可以利用 CAD/CAM 方式來製作 "Endocrowns" 來保留較多齒質，而且較方便製作，預後可避免失敗的風險。Internal ferrule concept 是相當重要的觀念，並且搭配 HPP(High Polymerization) 材料，可減少牙齒斷裂的機會。試戴完成後黏著工作勿必要確實，隔濕、酸蝕、塗上黏著劑與黏膠，邊緣的完整性是治療成功的關鍵，咬頭強度的恢復是必須

TABLE 4-4 The 20+ reasons for applying IDS

Reason	Explanation
1. Bonding to freshly cut dentin	Dentin contamination reduces the bond strength.
2. Proper polymerization and stabilization of the hybrid layer	The dentin adhesive needs to be thicker than the oxygen-inhibited layer. A thick adhesive will prevent seating of the restoration unless applied before impression-making.
3. Selective wet dentin bonding	Enamel requires dry bonding, and dentin bonding is a wet process. IDS focuses on wet dentin bonding immediately after tooth preparation (stage I). Enamel is bonded separately during restoration delivery (stage II).
4. Delayed loading of the dentin bond	Postponed restoration delivery allows for the maturation of the IDS dentin bond (15%–25% increase due to resin postpolymerization).
5. Decreased bacterial leakage	Provisional restorations always leak. IDS prevents bacteria from entering the dentinal tubules during provisionalization.
6. Decreased sensitivity during provisional stage	IDS acts as a dentin desensitizer. No other desensitizer is needed.
7. Decreased postoperative sensitivity	IDS prevents gap formation and the related hydrodynamic fluid movements causing pain.
8. Improved tooth preparation	IDS (and the bio-base) fills undercuts, produces a smoother surface, and improves geometry.
9. Reinforcement of remaining tooth structure	IDS and the composite resin additions (bio-base) support undermined/unsupported cusps that could have fractured during the provisional stage.
10. Substitution of retention/resistance form	IDS converts any type of preparation to a bondable substrate, which removes the need for specific geometry and stabilization (unless required for proper positioning).
11. Strengthening effect on crowns/onlays/veneers	The brittleness of ceramics is compensated by the underlying bond even in thin restorations like porcelain veneers.
12. Facilitated try-in procedures and occlusal adjustments	The desensitizing effect of IDS precludes the need for anesthesia, preserving lip dynamics and natural proprioception.
13. Compatibility of adhesives and luting cements	Simplified adhesives have acidic components that interact with self-curing cements. IDS and bio-base eliminate those interactions.
14. Use of light-activated products always possible	IDS is a barrier preventing the toxic leaching of unpolymerized monomers into dentin (in the case of a thick opaque restoration).
15. Spot bonding temporaries	Areas of IDS can be used for adherence of resin-based temporaries (by leaving small surfaces unisolated) in cases of totally nonretentive preparations.
16. Omission of provisional cements	No bacterial leakage or sensitivity is expected, and temporaries can be locked without cement (shrink-fit technique), especially for veneer cases.
17. Optimal protection of direct pulp capping	Preceded by direct pulp capping with CaOH or MTA (plus a GIC barrier), IDS is a perfect seal from bacterial leakage.
18. Sealing of ETT/IPDS	Preceded by isolation of the canals with a GIC barrier, IDS is a perfect seal from bacterial recolonization of the canals. IDS, however, should be preferably performed before endodontic treatment (IPDS) because endodontic irrigants and sealers contaminate the dentin and decrease the resin-dentin bonding potential.
19. DME complements IDS	IDS (or IPDS) always precedes DME; they complement each other.
20. Two-stage placement of direct restorations	IDS can be applied to multiple teeth (desensitization effect) when time constraints do not allow final restoration during the same session, limiting the need for anesthesia at the next appointment.
21. Protection of root surfaces and biocorroded dentin	The resin-coated surface is more resistant to demineralization, plaque adherence, and growth. Addition of a flowable liner to the IDS layer further improves the durability of the protective coating.

圖八：二十個要做 Immediate dentin sealing(IDS) 的理由

TABLE 4-6 Workflow and data acquisition for Biocopy mode

No-prep (Fig 4-29)		Prep (Figs 4-27 and 4-28)	
1. Impression/scan preoperative teeth → Dataset 1		1. Impression/scan preoperative teeth	
2. Digital or analog wax-up → Silicon indexes		2. Digital or analog wax-up → Silicon indexes	
3. Intraoral mock-up → Two ways:		3. Intraoral mock-up → Two ways:	
Mock-up accepted (no changes) → Scan wax-up = Dataset 2	Mock-up edited → Scan mock-up = Dataset 2	Mock-up accepted (no changes) → Scan wax-up = Dataset 2	Mock-up edited → Scan mock-up = Dataset 2
4. Design/mill restorations ("Biocopy") → Subtract dataset 1 from dataset 2		4. Mock-up-driven tooth micropreparations → Impression/scan preparations = Dataset 1	
-		5. Design/mill restorations ("Biocopy") → Subtract dataset 1 from dataset 2	

圖九：透過數位化流程與資料取得的來進行生物拷貝模式製作假牙

的，尤其是根管治療後的牙齒，透過適當的復形，覆蓋保護咬頭就能避免牙齒斷裂的危機。前牙的重建考慮到對稱性與型態改善，可以透過數位化流程（請見圖九），來複製出型態相似的牙齒，達到自然和諧美觀的成果，必要時加上手工的雕刻與客製化的質地調整，達到更理想的美觀。

四、前牙美學修復技巧 (Veneer 貼片)

本書作者將前牙的陶瓷黏著復形物分成五類（請見圖十），依照重建時切端的長度是否增加，牙冠是否完全覆蓋還是曾經根管治療過，以案例方式呈現各類型的治療過程，第一類主要是牙齒變色問題，無法透過牙齒美白改善而使用貼片來恢復美觀，第二類則是有較大的型態調整與修復，常見的釘狀齒 (conoid teeth)、關閉齒縫間的黑三角洞或牙縫過大問題、切端長度增長與外型弧線豐隆度增強，第三類為較大範圍延伸的復形物，如牙冠斷裂或是植牙贗復物的製作，甚

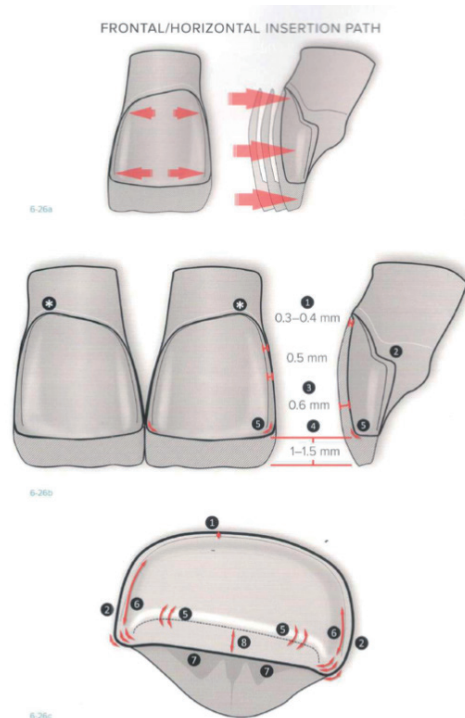
至是嚴重牙釉質缺損，必須透過較大範圍的貼片甚至是全覆蓋式牙冠來重建其功能與美觀。第四、五類則是針對嚴重缺損與咬合重建時，透過全瓷冠與 endocrowns 才能改善獲得良好的結果的案例，咬合面的貼片可以保留更多齒質，盡量以保守微創的方式作為治療計畫的優先考量，牙齒備製與修型可在最終模擬結果後才開始進行。臨床上建議可依此八個項目做檢視清單（請見圖十一），確保修型量足夠與細節完成。鄰接面與牙根區的邊緣尤其重要可用音波器械來使其平整光滑，包覆性要足夠以免露出交界區造成美觀問題。印模、製作臨時假牙、比色、技師端的瓷塊選擇與燒瓷製程優缺點說明介紹。製作三個耐火模是必要的，有切 dies 的原始模、solid model 和軟組織模型。如此才能確保密合度、排列和諧對稱、確保貼片與牙齦相對位置正確無誤。最後的試戴黏著固定和後牙一樣要做好隔濕、試戴、表面處理、塗上黏著劑後、黏膠固定黏光照聚合，在清除多於殘膠後，最後拋光打亮完成。詳細步驟（請見圖十二）。

BOX 6-1 Classification of indications for BPRs

TYPE I Teeth resistant to bleaching	
Type IA	Tetracycline discoloration of degrees III and IV
Type IB	Lack of response to external or internal bleaching
TYPE II Major morphologic modifications	
Type IIA	Conoid teeth
Type IIB	Interdental triangles and diastemata to be closed
Type IIC	Augmentation of incisal length and prominence
TYPE III Extensive restorations in adults	
Type IIIA	Extended coronal fractures
Type IIIB	Extended loss of enamel by biocorrosion and wear
Type IIIC	Generalized congenital and acquired malformations
TYPE IV Full-coverage crowns	
Type IVA	Dentin-bonded crowns (indications similar to type III)
Type IVB	Replacement of existing full-coverage crowns
TYPE V Endocrowns	
Prospective type	Restoration of severely broken-down endodontically treated teeth

圖十：BPR(Bonded Porcelain Restorations) 的分類與適應症

Checklist for anterior BPR preparation	
1	Chamfer size (0.3–0.4 mm)
2	Interdental extension for miniwings
3	Axial reduction (0.6 mm) - CHECK WITH INDEX
4	Incisal reduction (1–1.5 mm) - CHECK WITH INDEX
5	Absence of sharp internal line angles
6	Absence of retentive concavities (interdental)
7	Margin definition (palatal butt margin)
8	Incisal edge "seat"



圖十一：前牙 BPR 的檢查清單 (checklist) 與適應症

TABLE 6-3 Detailed instructions for adhesive delivery after try-in

Step	Instruments and methods	Notes
1. Composite resin preheating	Turn on Calset (AdDent), select the red flashing light (68°C/155°F), and use micro-hybrid composite resin (eg, Herculite XRV Enamel shade or ENA HRI Dentin shade, Micerium) preheated for 5 to 15 minutes.	Select shade based on dentin porcelain used by ceramist. Caution: Some composite resin brands may start setting after more than 15 minutes in Calset.
2. Isolation/final adjustments	Place rubber dam with clamp #212 on the treated tooth and test seating of the first restoration to deliver. In case of incomplete seating, place articulating paper proximally and insert the restoration. Hold the restoration and slightly pull the paper to mark the contact. Adjust the contact with a flexible disk or fine diamond bur at low speed. Insertion must be 100% passive (no friction or rebound). Repolish contacts with silicon/diamond points.	Strong contacts will result in slight rebounding of the restoration when releasing pressure. Further adjustment is necessary.
3. Restoration conditioning – Part I	Wear gloves, masks, and glasses. Clean fitting surface with alcohol. If feldspathic porcelain veneer: Etch the intaglio for 90 seconds with 9.6%–10% HF acid and rinse copiously. If lithium disilicate (e.max): Etch only 20 seconds with 5% HF acid (IPS Ceramic Etching Gel, Ivoclar) and rinse copiously. Optional (if large amounts of white debris): Pre-clean the fitting surface with 37% phosphoric acid (eg, Ultra-Etch) by rubbing with a microbrush for 30 seconds. Rinse and dip in an ultrasonic bath with distilled water or 90% ethanol for 2 to 4 minutes. Thoroughly dry, apply silane (eg, Silane, Ultradent) for 20 to 40 seconds, air-dry, and heat-dry in the oven for 1 minute or with a hair dryer for 2 minutes at 100°C/212°F.	Porcelain surfaces contaminated with try-in products must be carefully cleansed with resin solvents (acetone, ethanol, methanol, or methylene chloride) before starting adhesive conditioning. Do not air-abrade thin veneers with aluminum oxide! Rinsed HF etchant should be neutralized before flushing. An alternate method to heat-drying is to let dry an additional 5 minutes in the Calset unit or in air. A shiny surface after silane application reveals silane excess → heat-dry, then remove excess in an ultrasonic bath (alcohol) or by rinsing with boiling water, and heat-dry again.
4. Tooth conditioning – Part I	Use matrices/wedges to protect neighboring teeth. Airborne-particle abrade (eg, Microetcher, Danville, with CoJet or 30- μm Al_2O_3) until the preparation surface is completely dull. Apply phosphoric acid to the entire surface and 1 mm beyond the margins for 30 seconds, rinse (20 seconds), and thoroughly dry.	Dentin exposure should have been treated before impression with the IDS technique. In case of missed dentin exposures, a dentin primer should be used. CoJet and silane should be used on old existing composite resin restorations.
5. Restoration conditioning – Part II	OptiBond FL Bottle 2 – (Black cap) Apply adhesive resin (eg, OptiBond FL Adhesive only, no Primer) at the intaglio surface of the veneer, air-thin, and store under a light shield (eg, Vivapad).	Adhesive resins are sensitive to light, so shielding is necessary until insertion to prevent premature polymerization.
6. Tooth conditioning – Part II	Apply adhesive resin to the preparation surface (eg, OptiBond FL Adhesive only, no Primer unless dentin exposures are detected) and air-thin, but DO NOT polymerize!	This should always be the last step before insertion of the restoration.

TABLE 6-3 (cont) Detailed instructions for adhesive delivery after try-in

Step	Instruments and methods	Notes
7. Insertion	Insert preheated composite in the restoration, spread, and slowly insert onto the tooth. Use finger pressure to seat onto the tooth . Remove gross excesses with a DD1 instrument (Hu-Friedy). Remove the wedges/matrix (hold the restoration during this step). Push the restoration further down until complete insertion.	
8. Excess removal and light polymerization	Push veneer further down. Use the DD1 in the embrasures to remove all excesses. Do not floss as this could induce fracture. Polymerize from all sides (total 60 to 90 seconds per surface, depending on veneer thickness) but never for more than 20-second increments , then move to the next surface.	Before polymerization, pushing the restoration and removing excesses is repeated until no further excesses are extruding from margins.
9. Air-blocking	Place glycerin gel (eg, K-Y Jelly) over the margins and polymerize (10 seconds per surface). Rinse and dry.	
10. Removal of excesses and resin flashes	Hand instruments only! Check the margins with a scaler, DD7-DD10 instruments (Hu-Friedy), and #12 scalpel blade. Remove clamp if necessary.	Avoid using burs on ceramic margins unless a major composite resin excess needs to be removed.
11. Repeat for next restoration	Move clamp #212 onto the next tooth to be treated and repeat steps 3 to 10 for the next restoration. The insertion sequence should always be rehearsed on a solid model before starting delivery of a group of restorations. Overlapping teeth may dictate a specific insertion sequence to avoid loss of interdental contacts.	Incomplete seating of the next restoration is usually caused by excess resin flashes at the interdental contacts or contamination of the preparation surface during delivery of the previous restoration.
12. Occlusal adjustments	Remove rubber dam and adjust high contacts in maximal intercuspation with fine diamond burs followed by silicon/diamond polishing points. Adjust dynamic guidance and repolish if necessary.	Air/water spray will prevent damaging the ceramic when adjusting/polishing. Advise the patient that interdental openings are created by rubber dam placement and will close after the gingiva recovers its position after a few hours.

圖十二：試戴黏著詳細步驟說明

TABLE 7-1 Step-by-step procedures for fracture repair with and without fragments

With fragment	Without fragment
1. Isolate the dental segment under rubber dam and protect the patient's airways from sand inhalation.	
2. In the presence of exposed dentin, seal the exposed dentin according to the IDS protocol: Use a diamond bur to freshly cut the dentin, followed by etching, priming, placement of adhesive resin, polymerization, and air-blocking.	
3. Clean and roughen the fractured surface and enamel with a diamond bur at low speed (in case of ceramic, remove the glaze layer surrounding the fracture). No composite resin remnants must be found.	
4. Load silicoating sand into the intraoral sandblaster.	
5. Check the efficiency on a metal strip (metal must turn to a uniform dark color).	
6. Air-abrade the fractured tooth/restoration surface with CoJet for about 5 to 10 seconds (depending on the surface area); neighboring teeth should be protected with a metal matrix.	
7. Test the fragment fit and seating on the tooth. If the IDS layer is interfering, slightly adjust the fitting surfaces.	7. Etch the fractured tooth/restoration surface with phosphoric acid for 30 seconds, rinse, and thoroughly air-dry.
8. Clean and roughen the fitting surface of the fragment with a diamond bur at low speed. No composite resin remnants must be found. Condition the fragment fitting surface as indicated for that material (HF acid etching for ceramics, airborne-particle abrasion for composite resin).	8. Apply silane to the restoration surface for 20–40 seconds, thoroughly air-dry, and eventually heat-dry with a hair dryer at low power or light-polymerization unit. A 5-minute delay (completely dry) after silanization will enhance the effect of the silane. The silanated surface should not look shiny .
9. Etch the fractured tooth/restoration and fragment fitting surfaces with phosphoric acid for 30 seconds, rinse, and thoroughly air-dry. If a ceramic fragment, clean in an ultrasonic bath.	9. Apply low-viscosity adhesive resin and air-thin.
10. Apply silane to the fractured tooth/restoration and fragment fitting surfaces for 20–40 seconds, thoroughly air-dry, and eventually heat-dry with a hair dryer at low power or light-polymerization unit. A 5-minute delay (completely dry) after silanization will enhance the effect of the silane. The silanated surface should not look shiny .	10. Restore with light-polymerizing composite resin and finish as for a natural tooth.
11. Apply low-viscosity adhesive resin to the fractured tooth/restoration and fragment fitting surfaces and air-thin.	
12. Deliver the fragment with light-polymerizing composite resin* and finish as for a regular bonded restoration.	

*In case of deficient marginal adaptation of a fragment, choose a dentin shade of composite resin.

圖十三：斷片修補的流程步驟

五、維護與修補 (治療後的危機處理)

治療後的定期追蹤檢查、保養洗牙去除牙結石與維修是必要的，成功的 BPR 不只是保留最多的 enamel & dentin layer 來維持完整的生物機械強度，也能有健康的牙周組織。使用一段時間後若有染色建議可以重新拋光，有磨牙的病人在貼片製作完成後必需給予咬合版保護。若是局部缺角或是形成裂痕染色，可考慮用複合樹脂填補修復，詳細步驟 (請見圖十三)。

綜合評論

整體而言，本書內容相當豐富詳盡，也將臨床常見的問題作出說明與介紹，最大的亮點是提供了許多實用的小短片 (請參見課本所附 QRcode) 與練習的技巧、心得分享。讓讀者能夠明白治療的方針與作法。是當代仿生修復美容牙科學一本值得收藏的工具書。唯有一些作法仍缺乏長期追蹤報告，建議讀者僅作為治療參考的方式或指引，實際仍須依臨床實際情況做調整與改進，並且定期追蹤才能確保長期治療成果。

Using Indirect Composite Resin Onlay as an Interim-to-Permanent Treatment for a Severely Decayed Molar: A Case Report

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Even bonded porcelain restorations are now the mainstream in restorative practices, indirect composite resin restorations are still advantageous since they require less learning time, less polymerization stress compared to direct composite restorations, and easily adjustable and repairable compared to ceramic restorations. Recent evidence show indirect composite resin restoration has no statistically significant different annual failure rates compared to indirect porcelain restorations and direct composite resin restorations. Here we present a case of a 20-year-old young woman whose tooth 37 has a large and deep decay on distal surface due to impaction of tooth 38. Indirect composite resin onlay was employed as an interim-to-permanent restoration on demand of future time-lasting orthodontic treatment. Four challenges were faced including deep distal margin, narrow buccal shelf, deep caries and concern of polymerization stress. Solutions toward these problems include proper field isolation, a precise model obtained by combining putty-wash impression and digital impression validation, conservative caries management, and reconstruction by an indirect composite resin onlay with use of bulk-fill material as a liner. The patient is satisfied with this conservative treatment, esthetic outcome, and the gingival health.

Keywords : Indirect composite resin restoration, polymerization stress, interim restoration

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Fig 1 Initial condition. Faulty restoration was noted on tooth 37.

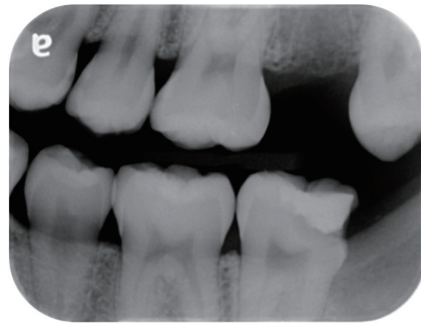


Fig 2 Bitewing film of tooth 37. Secondary caries was noted beneath the old restoration with proximity to the pulp.

Introduction

Though the direct composite resin restorations have been the most common method to restore dental caries, fracture, or other decays, the indirect restorations have been well-accepted along the developments of high strength ceramic materials and adhesive techniques. Bonded porcelain restoration is now a prime choice of restorative methods for severe decays, while indirect composite resin restoration still provides treatment alternatives toward medium-to-large cavities especially when uncertainty in definitive treatments and economic concerns^{1,2}.

Indirect composite resin restorations are advantageous since they require less learning time, less polymerization stress compared to direct composite restorations, and easily adjustable and repairable compared to ceramic restorations³. Recent evidences show indirect composite resin restoration has comparative annual failure rates compared to indirect porcelain restoration and direct composite resin restoration⁴.

Here we present a case receiving an indirect composite resin onlay as an interim-to-permanent treatment for large decayed molar caused by the impaction of a third molar. The patient will receive the orthodontic treatment in the future and the need of reparability should be considered. The caries was in proximity to the pulp and the disto-buccal margin was deep, subgingival about 0.5mm. Moreover, her buccal shelf is narrow and buccal mucosa often impeded to the approach to the cavity. These problems all set up challenges in pulp protection, deep margin management, field isolation and impression taking. Below we show how we overcame those problems in detail and clarify the advantages of indirect composite resin onlay in treating such a dental decay.

Case

This 20-year-old female patient is a college student and was referred from oral-and-maxillofacial surgery department for management of tooth 37 caries after tooth 27, 38 extractions. She denied major systemic diseases nor known food and/or drug allergy.



Fig 3 After caries removal, disto-lingual cusp was removed due to thin remaining structure. Distal margin was subgingival about 0.5mm. Proper isolation can still be achieved.

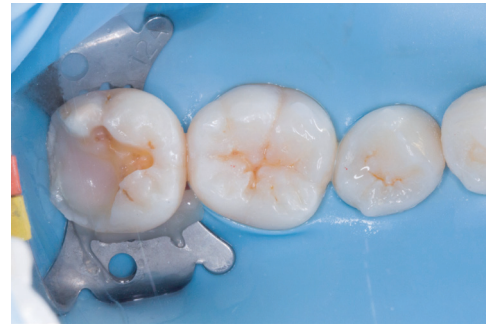


Fig 4 Immediate dentin sealing with cavity design optimization. Central fossa of tooth 37 was prepared for retention form. Cavity floor was smoothed for reducing inheriting stress concentration.

Tooth 37 with a faulty restoration, secondary caries, and deep distal margin was noted upon clinical examination. The caries was close to the pulp, but tooth 37 was responsive to electric pulp test (Fig.1). The patient was not having subjective symptom and signs. The radiographic examination showed the faulty restoration and deep decay in Tooth 37, while the distal margin of this decay may be deeply subgingival (Fig.2).

Other local findings include a distal-tilted tooth 17, which was previously endodontically treated, but its restoration has been dislodged to expose distal subgingival margin and gutta-percha point root canal filling. Cross-bite over tooth 12-42, 22-32 area and missing of tooth 27 were also found. Orthodontic treatment was suggested for correction of cross-bite issue, uprighting and force-eruption of tooth 17 for more ideal margin placement, and protraction of tooth 28 to close the edentulous space from missing tooth 27.

For tooth 37, considering its large decay size, vital pulp status and deep cavity margin, indirect restoration was indicated. On demand of future time-lasting orthodontic treatment, indirect composite resin onlay was employed as an interim-to-permanent restoration.

© Treatment Procedures

During designing the composite resin onlay, four challenges were faced: deep distal margin, narrow buccal shelf, deep caries and concern of polymerization stress. Solutions toward these problems include proper field isolation, a precise model obtained by combining putty-wash impression and digital impression validation, conservative caries management, and reconstruction by an indirect composite resin onlay with use of bulk-fill material as a liner.

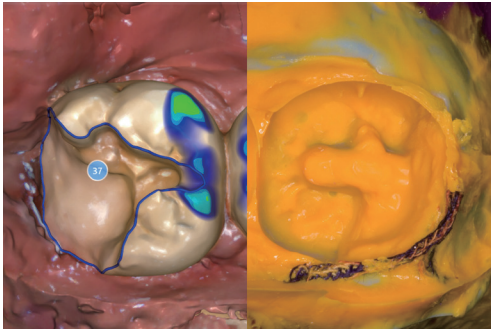


Fig 5 Digital intra-oral scan and conventional putty-wash technique were employed. The former was used for intraoperative assessment of margin preparation and depth. It was also the reference when later the die was trimmed and ditched. The conventional impression was performed later after base build up and cavity design optimization.

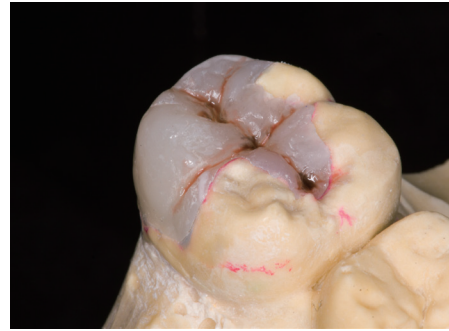


Fig 6 Indirect composite resin onlay build up.

◎ First visit

Under local anesthesia, caries and weakened tooth structure were removed with excavator and low speed round bur (10,000rpm). Tooth 37 was evaluated again for its remained structure (Fig.3). No pulp exposure was noted after careful caries removal. Though distal margin was deeply subgingival, isolation could be achieved with rubber dam of stronger elasticity (Isodam, Four D Rubber, Heanor) and flowable resin seals. Indirect pulp capping was done with calcium hydroxide composite (Dycal, Dentsply, New York) and sealed with a thin layer of resin-modified glass ionomer cement (Vitrebond, 3M, Minnesota). The cavity was temporarily filled with high-viscosity polycarboxylate cement (HY-Bond Polycarboxylate Cement, Shofu, Kyoto).

◎ Second visit

In the next visit, patient had no complaint about pain nor hypersensitivity. After removing the temporary restorations, immediate dentin sealing was done with filler-contained dental adhesive (OptiBond FL, Kerr, California) under a total-etch technique. The base was build up with composite resin (Filtek Z250 Universal Restorative System, 3M, Minnesota), and cavity design optimization was performed afterward (Fig.4).

To overcome the limitation of narrow buccal space, putty-wash technique was employed by using vinyl polysiloxane impression materials of three different viscosities (Aquasil soft putty, medium body, and light body, all from Dentsply, New York). Digital impression was also captured (Cerec Primescan, Dentsply, New York) for

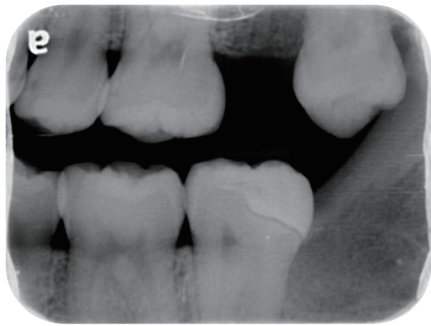


Fig 7 Try-in phase.

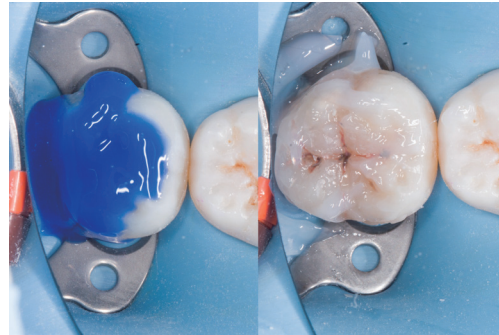


Fig 8 Total-etch technique was utilized. Enamel was etched for 30s and dentin for 15s then rinsed and gently air dried. After resin cement application and the onlay fully seated. It was fully cured under the blocking of oxide-inhibiting layer with glycerin gel.

better identification of margins with color information and non-restricted visualization (Fig.5).

© Laboratory works

After pouring the stone cast and die fabrication, indirect composite resin onlay was built up. The first layer was lined with the flowable resin (SDR Flow plus A3, Dentsply, New York), and then layered with hybrid composite resin (Spectrum TPH3 A2, Dentsply, New York; SOLARE Sculpt A2, GC, Tokyo). After finishing and polishing by two polishing systems (Enhance Dental Finishing System, Dentsply, New York; Lucida Composite Glass System, Diashine, Washington), the indirect composite resin onlay was stained with fluorescent, light cure resin stains (Lite Art, Shofu, Kyoto) (Fig.6).

© Third visit

On the return visit, fitness of composite resin onlay was checked with vinyl polyether silicone impression material (FitChecker, GC, Tokyo). Marginal fitness was detected by using a sharp explorer and X-ray film (Fig.7). For reliable adhesive cementation, rubber dam was placed. After removing the temporary restoration, a disclosing agent was applied to inspect the biofilms. The contaminants were removed by sandblasting with 27um aluminum oxide. Total-etch technique was utilized for surface preparation. Chemical-cured bonding agent (Prime & Bond XP and Self Cure Activator, Dentsply, New York) was mixed then applied on the cavity surfaces and thinned under gentle air blowing. Dual-cure resin cement (Core-X Flow, Dentsply, New York) was applied. After composite resin onlay was fully seated, each surface was tack cured. Excessive cement was removed. Glycerin gel was applied, then the restoration was fully polymerized (Fig. 8).



Fig 9 Check occlusion.



Fig 10 One week follow up after tooth 37 indirect composite resin onlay delivery.

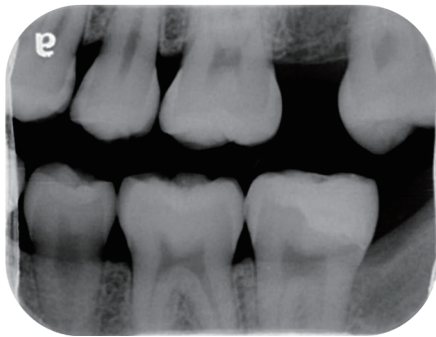


Fig 11 Bitewing film of tooth 37 after the restoration delivered for 2 months.

After removal of rubber dam, residual cement was checked again. Occlusion was checked with articulating paper (Fig.9). Tooth 28 has no occlusal interference with tooth 37.

© Re-call visits

The patient was arranged to be re-evaluated after either 1 week or 2 months after indirect composite resin onlay delivery. She returned and reported no complaint about pain nor thermal hypersensitivity. The composite resin onlay remained intact without decay or stain (Fig.10, 11). Tooth 37 was responsive to the electric pulp test. No excessive cement existed, and her gingival health was good.

Discussion

Development of adhesive cementation gives rise to bonded ceramics and composite restorations, which lowers the need of invasive retention form preparation thus preserves as much tooth structure as possible. Despite of the trend of porcelain restorations, indirect composite restorations provide treatment options especially when repairability and patient's budget are concerned. In our case, the changes of occlusal relationship during and after orthodontic treatment reflect the need of frequent occlusal adjustment. The intraoral adjustment of composite resin is more user-friendly and less technique sensitive in comparison to that on

ceramics. The higher strength but brittleness of ceramics make them hard to grind and also lead to the risk of crack and eventually fracture⁵.

However, the stress caused by polymerization shrinkage is a great concern of composite restorations. The polymerization stress may result in marginal gap formation, leading to bacterial ingress and tooth sensitivity³. Alternative methods including modifying the compositions (filler, phase, coupling agent, matrix) of the composites, the placement strategies (the use of liner of flowable/unfilled composites), modifications of light irradiation intensity or total energy, alternative light-curing source, and different photoactivation modes have been investigated but did not completely diminish the stress^{1, 6, 7}. Indirect fabrication of restoration is another way to minimize polymerization stress. It also has other benefits including less chair time needed, much wear-resistance, and improved physical properties compared to directly fabricated ones. Better contours and polishing can also be achieved to ensure an easy way to maintain or clean.[8] The most recent evidence shows that indirect composite resin restoration had comparative annual failure rate (AFR) to indirect feldspathic ceramics (1.81 and 1.62, respectively)⁴, which is lower than that (AFR= 2.19) of direct composite resin. Even there was no statistic difference between above-mentioned 3 methods, the author preferred the one with lower cost, less-invasive tooth preparation, and simpler technique in the light of that longevity is nearly the same. As a result, he recommended using direct composite over indirect composite.

In our case, weighting against the cost, amount of tooth preparation, the difficulty to build up directly in the mouth, and the need of chair time, we chose indirect method for this restoration. Through this method, this onlay can be sufficiently polymerized through extraoral irradiation. Otherwise, multiple approaches have been done to minimize possible polymerization stress, such as the use of a layer of bulk-fill composite resin (SDR plus, Dentsply, New York) combining with hybrid composite. The low modulus and low viscosity liner does not only reduce the polymerization stress, but also adapt better on the cast thus creating a more uniform cementation layer.

In this case, the narrow buccal vestibular space precludes the placement of both clinician's handpieces and the patient's own toothbrush over disto-buccal area of tooth 37. Owe to the fabrication process on the die cast, a proper anatomic contour and polished process can be achieved, providing a maintainable condition for oral hygiene.

The narrow buccal space is also a great challenge in impression taking. Two kinds of impression were performed and cross-validated. Convention impression was done with a putty-wash technique under open-mouth impression⁹. The first impression, which acted as a custom tray in subsequent use, was obtained with putty-consistency and a uniform thickness of cutback was done. A clear re-position mark was also made. Secondly, a low viscosity light-body was applied on tooth directly and medium-body was loaded on the first putty impression. Then, the putty was seated carefully according

to re-position landmark and force the light-body material into fine areas. During setting of impression materials, the patient's mouth was kept opened and her left cheek was retracted by the clinician. Digital impression was also performed for immediate validation of the sharpness of margin. While ditching the margins of the die cast, unrestricted visualization of digital impression aided in margin identification of thin fins of extension existed in the silicone impression.

Yet, for a successful indirect restoration, moisture control and margin placement are prerequisites⁸. In our case, isolation was achieved under sufficient local anesthesia and proper clamp and rubber dam selection. Good gingival healing after tooth 38 extraction and gingivectomy also benefits the isolation. When comparing initial and 2-month postoperative periapical film, the distal bone has been lowered and a proper biologic width has been re-established.

Conclusion

In this case report, indirect composite resin onlay was chosen as an interim-to-permanent restoration for its reparability for subsequent orthodontic treatment needs, and minimal amount of retention preparation. In recent reviews and clinical studies, indirect composite resin restorations have comparable success rate to indirect feldspathic ceramic restorations. To achieve optimal outcome, four challenges were overcome. At first, the deep distal margin and narrow buccal shelf made both the field isolation and impression taking difficult. Putty-wash

technique was employed for rigid support of impression and blocking cheek off. An additional digital impression was used for validation of margin. Secondly, deep caries management and pulp protection were performed under good field isolation, conservative caries removal, and calcium hydroxide capping. Thirdly, the layered composite restoration combining a bulk-fill and a hybrid composite reduced the inherent contraction stress. Finally, a good cementation process accomplished the treatment and provided excellent marginal sealing.

REFERENCES

1. Ritter AV, Boushell LW, and Walter R, Sturdevant's Art and Science of Operative Dentistry 7 th ed., Elsevier, St. Louis, 2019
2. Ferencz JL, Silva NRFA, and Navarro JM, High-strength Ceramics: Interdisciplinary Perspectivesed., Quintessence Publishing, Illinois, 2014
3. Hilton TJ, Ferracane JL, and Broome JC, Summitt's Fundamentals of Operative Dentistry: A Contemporary Approach 4 th ed., Quintessence Publishing, Hanover Park, 2013
4. Vetromilla BM, Opdam NJ, Leida FL, Sarkis-Onofre R, Demarco FF, van der Loo MPJ, Cenci MS, and Pereira-Cenci T, Treatment options for large posterior restorations: a systematic review and network meta-analysis. *J Am Dent Assoc*, 2020. 151(8): 614-624.e18.
5. Kelly JR, Ceramics in Dentistry: Principle and Practice., Quintessence Publishing, Illinois, 2016
6. Meereis CTW, Münchow EA, de Oliveira da Rosa WL, da Silva AF, and Piva E, Polymerization shrinkage stress of resin-based dental materials: A systematic review and meta-analyses of composition strategies. *J Mech Behav Biomed Mater*, 2018. 82: 268-281.
7. Münchow EA, Meereis CTW, de Oliveira da Rosa WL, da Silva AF, and Piva E, Polymerization shrinkage stress of resin-based dental materials: A systematic review and meta-analyses of technique protocol and photo-activation strategies. *J Mech Behav Biomed Mater*, 2018. 82: 77-86.
8. Garg N and Garg A, Textbook of Operative Dentistry 3 th ed., Jaypee Brothers Medical Publishers, Bangladesh, 2015
9. Anusavice KJ, Shen C, and Rawls HR, Philips' Science of Dental Materials 12 th ed., Elsevier, St. Louis, 2012

使用間接複合樹脂冠蓋體做為大量齲蝕臼齒的過渡－ 永久性治療：病例報告

連盟家¹ 陳聖穩² 張伯瑜³ 李宗霖⁴ 莊淑芬^{5*}

間接陶瓷修復體已成為現今復形工作的主流，但間接複合樹脂修復體在臨床易學習性、較少聚合應力等特性比直接複合樹脂復形具優勢，而在易於調整、可修復等特性比陶瓷更具優勢。在近期的證據顯示間接複合樹脂修復體與間接陶瓷修復體、直接複合樹脂修復的年成功率沒有顯著差異。在此病例報告中，患者為20歲年輕女性，左下因智齒阻生而導致第二大白齒大量齲蝕、伴隨深的遠心邊緣，我們利用間接複合樹脂冠蓋體作為過渡－永久性治療以配合其後長期矯正需求。臨床上我們共面臨四個挑戰：深的遠心邊緣、極窄的頰棚、極深的齲蝕與對於聚合應力的擔憂，解決方法包含適當且足夠的操作區隔離、併用傳統雙向二次印模法與數位印模驗證得到的準確模型、保守性齲蝕移除、口外間接複合樹脂聚合且合併使用塊填樹脂材做襯底。患者對這樣保守治療策略、美觀、與軟組織健康相當滿意。

關鍵字：間接複合樹脂復形、聚合應力、過渡性修復

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數位牙科設計軟體輔助在矯正牙齒療程以複合樹脂直接填補釘狀齒之應用 - 病例報告

劉曉暘¹ 姜昱至^{2*}

釘狀齒 (peg lateral) 常出現在牙體復形醫師與矯正醫師協同治療的病例中，治療前可採用詳細的前牙微笑分析 (smile analysis) 以及診斷蠟型 (diagnostic wax-up) 的堆築，預估治療成效。

在矯正療程中，以複合樹脂直接填補 (direct composite resin filling) 重建牙齒型態為目前最保守且具有修改空間的治療方法。雖然樹脂與陶瓷相比，較容易因飲食或牙菌斑堆積而染色，但維持良好的口腔清潔習慣、術後確實拋光以及回診追蹤定期重新拋光可加強樹脂填補物的顏色穩定度。

本案例嘗試使用數位牙科設計軟體來設計數位蠟型 (digital wax-up)，利用數位蠟型的可複製性，提升複合樹脂直接填補治療的準確度與對稱性。

關鍵詞：釘狀齒、數位牙科設計軟體、數位蠟型、複合樹脂直接填補、牙齒矯正

前言

釘狀齒 (peg lateral) 是指比一般型態更細窄的側門牙，為基因遺傳所致。根據統計，釘狀齒的盛行率在矯正患者族群 (2.7%) 中稍高於一般牙科患者 (1.9%)¹。

釘狀齒的復形方式包括複合樹脂直接填補 (direct composite resin filling)、樹脂貼片 (resin veneer)、陶瓷貼片 (ceramic veneer)、假

牙牙冠 (crown) 等，目的都是為了讓左右兩側的側門牙達到理想的牙齒型態以及長寬比。不論是否接受矯正治療的釘狀齒在進行修復前，往往需要先建立診斷蠟型 (diagnostic wax-up)，以利牙體復形醫師與矯正醫師、病人、牙技師等多方協調與溝通。

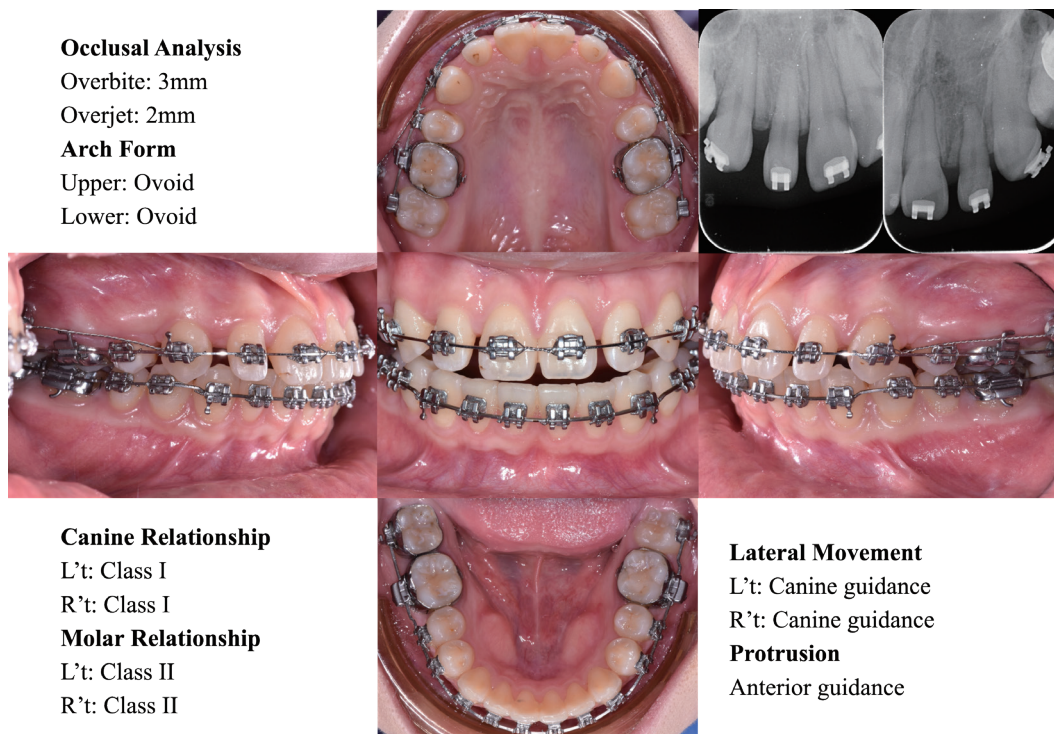
通常採用徒手堆蠟時，需要讓左右兩側蠟型完全對稱，對牙醫師與牙技師來說皆是挑戰。本病例中，嘗試使用數位設計軟體來

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圖一：全口口內照片、口內理學檢查以及口腔 x-ray 放射線影像檢查

設計蠟型，並配合複合樹脂直接堆築，將設計好的數位蠟型複製到病人口中，以恢復側門牙應有的型態。

病例

◎基本資料：

患者為 20 歲女性，正於臺大醫院矯正科進行全口矯正治療，左上及右上側門牙天生型態為釘狀齒，矯正醫師希望能在矯正治療過程中將側門牙復形為標準型態，以利後續排列。

◎主訴：

左上及右上側門牙型態較細、較窄，希望可以復形為正常的比例與型態。

◎過去病史：

無全身性系統性疾病，亦無食物及藥物過敏。

◎過去牙科病史：

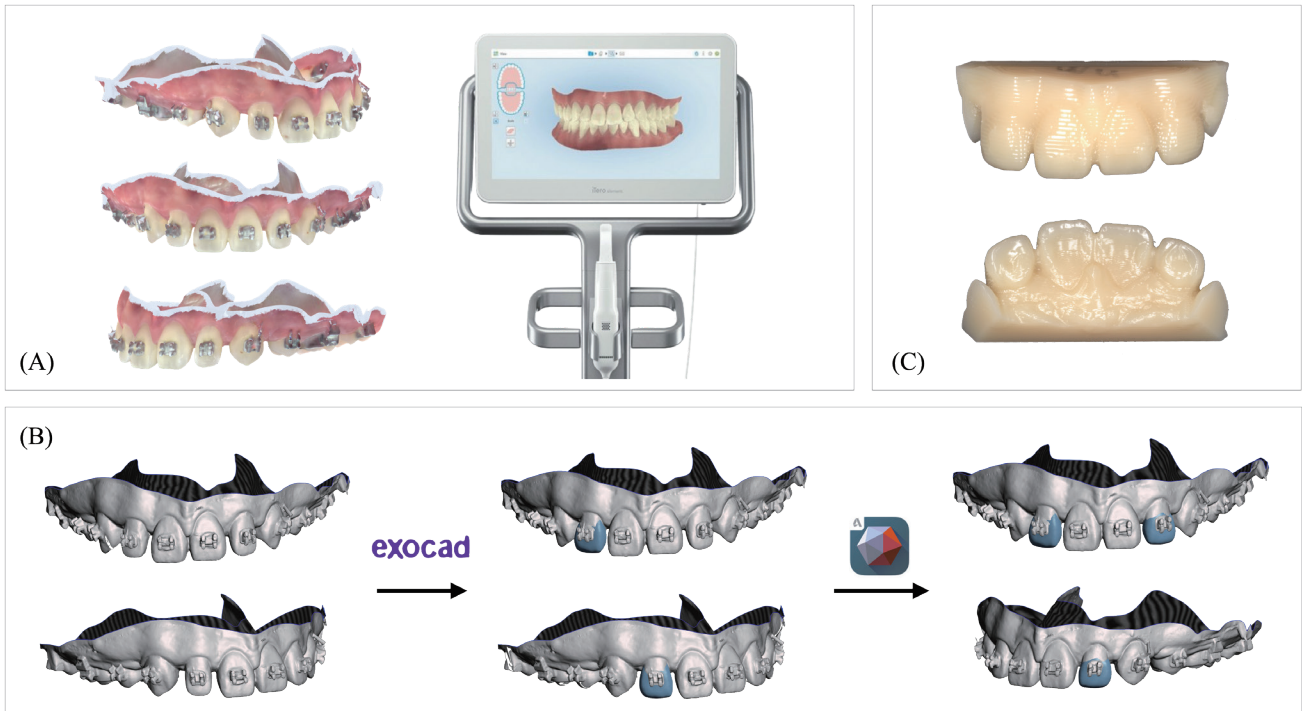
曾經接受過全口洗牙、拔牙以及複合樹脂填補，正在進行矯正治療中。

◎個人習慣：

1. 無抽菸、喝酒、吃檳榔之不良習慣。
2. 一天刷牙兩至三次，有使用牙間刷的習慣

◎口內理學檢查 (圖一)：

1. 牙弓型態：上下牙弓皆為橢圓形。
2. 咬合關係：



圖二：(A) 利用 iTero 口掃機進行口腔掃描及所得之彩色口掃檔。

(B) 利用數位設計軟體 Exocad 與 meshmixer 將型態大小完全相同的 12 及 22 數位蠟型媒合至病人口掃檔的 12、22 上。

(C) 切削出來的數位蠟型。

A. 犬齒關係：左右側皆為安格氏第一級犬齒關係

B. 臼齒關係：左右側皆為安格氏第二級臼齒關係

3. 垂直覆咬：3 mm；水平覆咬：2 mm

4. 前突運動為前方引導，側方運動為犬齒引導

5. 缺牙：齒位 14、24

6. 釘狀齒：齒位 12、22

7. 齒間空隙：13-12= 2.2 mm、
12-11=1 mm、
21-22=1.2 mm、
22-23=2.0 mm

◎口腔 x-ray 放射線影像檢查（圖一）：

12、22 為釘狀齒，無發現齲齒或根尖病灶，齒槽骨高度正常

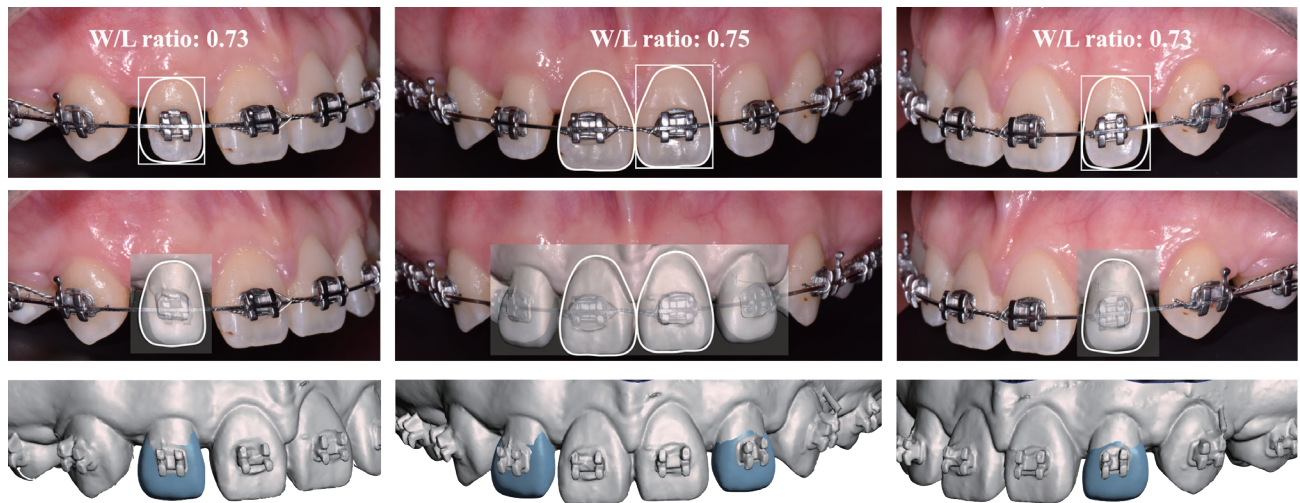
◎診斷：齒位 12、22 釘狀齒具齒間空隙

◎治療計畫：

1. 口腔衛教，加強正確清潔習慣
2. 齒位 12 及 22 複合樹脂直接填補

◎齒位 12 及 22 之治療過程

第一次約診：口腔掃描、治療計畫諮詢、製作數位蠟型（圖二(A-C)）

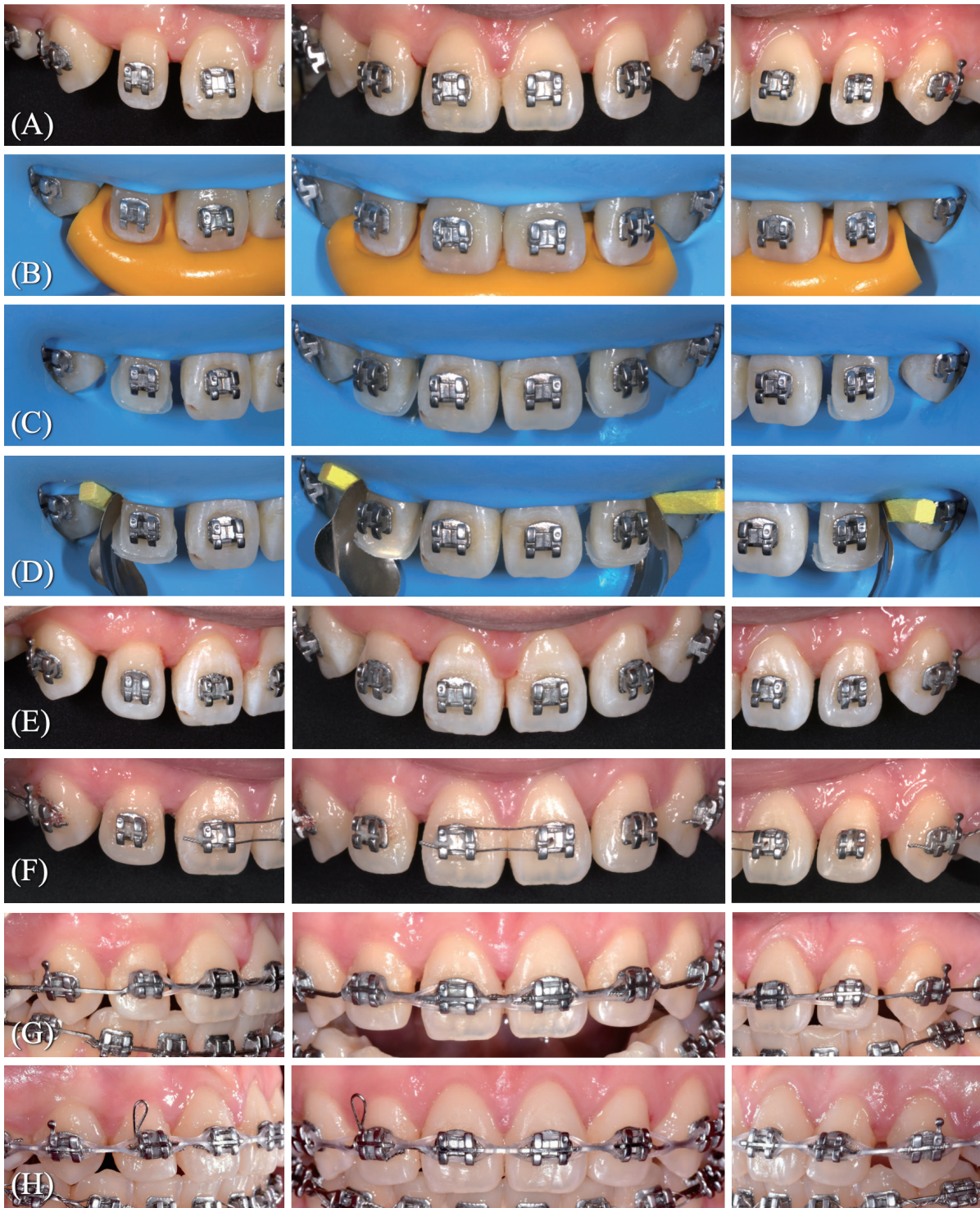


圖三：根據口內照及口掃檔合併做前牙比例分析，病人正中門牙長寬比為 0.75，設計的側門牙數位蠟型長寬比則為 0.73

1. 先利用 iTero 口掃機 (Element II、Align Technology, Inc) 進行口腔掃描 (圖二 (A))，向病人分析前牙型態並說明治療計畫
2. 根據口內照以及口掃檔合併做前牙比例分析 (圖三)
3. 利用 Exocad (exocad GmbH, version: v2.4-7290/64) 牙科數位設計軟體製作出長寬比為 0.73 之右上側門牙數位蠟型，並調整大小及角度，媒合到口掃檔的齒位 12 上 (圖二 (B))
4. 接著利用 meshmixer (Autodesk, Inc., version: 11.5.474) 3D 模型編輯軟體將齒位 12 的數位蠟型複製並鏡像翻轉，再媒合至齒位 22 上 (圖二 (B))
5. 數位蠟型以 Polymethyl methacrylate (PMMA) 切削製成 (圖二 (C))，並翻模製作 putty index

第二次約診：複合樹脂直接填補 (圖四 (A-E))

1. 首先進行樹脂比色，此病例選擇以 Amaris (VOCO) 樹脂進行填補，牙本質選擇 O4 色號，琺瑯質則選擇 TN 色號
2. 將上顎前牙 (齒位 13-23) 以橡皮帳 (rubber dam) 隔濕
3. 齒位 12 及 22 預計填補的表面以 27 μ m 氧化鋁噴砂，達到清潔效果的同時亦增加表面粗糙度，以利樹脂黏著
4. 確認 putty index 可放置至正確位置，檢查 putty 表面是否完全貼合齒位 11、21 切端及舌側面，確認完畢後先行移除 putty index (圖四 (B))



圖四：(A) 治療前。(B) 利用橡皮帳隔濕後，確認 putty index 可放置至正確位置。
(C) 利用琺瑯質色樹脂建立出 palatal shell。
(D) 鄰接面使用預製弧形的金屬隔片塑形並以 wedge 固定隔片。
(E) 治療後。(F) 兩個月追蹤。(G) 五個月追蹤。
(H) 九個月追蹤，可見牙縫逐漸收小，正中門牙與側門牙比例和諧，樹脂補綴物亦無變色的情形。

5. 齒位 12 及 22 以 37% 磷酸 (phosphoric acid) 酸蝕牙齒表面 30 秒，並以小毛刷來回摩擦表面
6. 沖水並吹乾所有表面後，塗抹通用型黏著劑 (Single Bond Universal Adhesive, 3M) 20 秒，吹薄後照光硬化 10 秒
7. 放置 putty index 至定位後，利用琺瑯質色樹脂 TN (Amaris, VOCO) 建立 palatal shell，照光硬化 10 秒，並於移除 putty index 後由舌側面再照光硬化 10 秒 (圖四 (C))
8. 鄰接面使用預製弧形的金屬隔片 (performed metal matrix) 塑形，以 wedge 固定隔片 (圖四 (D))
9. 依照仿生結構分別補上牙本質色 O4 (Amaris, VOCO) 以及琺瑯質色 TN (Amaris, VOCO) 的樹脂，唇側面與舌側面各照光硬化 40 秒
10. 以 soft disc (OptiDisc, Kerr) 及 ASAP polishing kit (Clinician's Choice) 將表面修形並拋光滑順

◎術後追蹤 (圖四 (F-H))

分別在術後兩個月 (圖四 (F))、五個月 (圖四 (G)) 及九個月 (圖四 (H)) 安排追蹤檢查，發現牙縫間隙隨著矯正過程逐漸收小，正中門牙與側門牙比例和諧，填補的樹脂也沒有邊緣或是表面變色的情形。

討 論

小牙症 (microdontia) 指牙齒大小小於標準型態，而最常見局部發生的齒位是上頷側門牙，此類側門牙從齒頸部到切端的寬度皆較一般側門牙窄，形態類似於「釘」或「樁」，故稱為「釘狀齒 (peg lateral)」²。釘狀齒為基因遺傳所致，較小型態的側門牙容易使得左上、右上正中門牙往遠心的方向移動，因此常和中線區域的齒間隙 (diastema) 一併發生^{2,3}。

多數研究顯示，釘狀齒的盛行率約介於 0.8%-8.4%²，2013 年 Fang Hua 等學者根據 30 篇論文所進行的 meta-analysis，發現釘狀齒的整體盛行率為 1.8%¹。盛行率的分佈會依照種族、性別、左右側而有所差異。人種而言，釘狀齒在蒙古人種中最高為常見，盛行率約為 3.1%，高於黑人 (1.5%) 及白人 (1.3%)¹；性別而言，女性的發生機率為男性的 1.35 倍^{1,2}，單側 (unilateral) 發生與雙側 (bilateral) 發生的機率並無太大差異，但就單側發生的案例而言，左上側門牙 (0.4%) 為釘狀齒的機率是右上側門牙 (0.2%) 的兩倍¹。

釘狀齒有許多種治療方式，型態調整上包括複合樹脂直接填補 (direct composite resin filling)、樹脂貼片 (resin veneer)、陶瓷貼片 (ceramic veneer) 以及假牙牙冠 (crown) 等等。除了牙齒本身型態上的改變，亦常需要協同矯正治療與牙冠增長術，以調整牙齒在牙弓上的排列、角度以及牙齦線高度，使得治療效果更佳理想。最重要的是，必須要在治療前進行詳盡的資料搜集與前牙微笑設計 (smile analysis)，並且與病人討論各種治

療選項的利弊優缺，才能給予病人最周全的、最適合的治療計畫³。

此病例原本的治療計畫選項有二，分別為複合樹脂直接填補以及陶瓷貼片。然而，考量到矯正治療仍在進行中，未來咬合以及牙齦線還有改變的可能，複合樹脂直接填補是當前最保守的治療方式，且此材料具有可更改、調整以及修復的特性³，是最適合此階段的治療方式。與病人充分討論後，雙方同意以此方式來將側門牙建立成理想的型態。

然而，長期而言複合樹脂有變色的可能³，尤其在口腔衛生習慣不良或是常攝取咖啡、茶等深色食物的病人口中，更容易使得樹脂表面染色，而與牙齒形成色差。因此也叮嚀病人要養成良好的口腔清潔習慣，除了降低蛀牙率之外，亦可減少樹脂變色的可能性⁴⁻⁶。同時，也要持續追蹤病人，定期拋光複合樹脂表面可以有效維持顏色穩定性³。未來矯正治療結束後，若病人想轉而選擇陶瓷貼片，可再以矯正治療後的前牙排列來設計貼片型態。

釘狀齒的近心側 (mesial) 及遠心側 (distal) 都還保留牙縫間隙 (spacing) 時，為牙體復形治療介入的最佳時機。此時牙體復形醫師有更多的空間能夠設計較理想的牙齒長寬比與型態，並使得牙根位置維持在牙冠的中間，讓病人更容易維持牙周清潔。然而，並非所有病例都有機會空出近、遠心兩側空間，亦非所有釘狀齒都需要同時調整兩側型態，因此治療時機的介入以及復形的部位還需要與矯正醫師密切討論與規劃³。此病例中，矯正醫師轉介來本科時，剛好近心及遠心側皆具有縫隙，且病人 12、22 的鄰接面型

態皆較直，不符合理想型態。因此決定在兩側都加上複合樹脂來重建側門牙應有的鄰接面輪廓 (proximal contour)，對於後續矯正醫師以長軸來判斷牙齒位置分配亦有助益。

分析此案例的前牙長寬比例時，發現病人左上及右上正中門牙的長寬比皆為 0.75，未有磨損跡象之正中門牙 (unworn central incisor) 平均長寬比為 0.71-0.84，可知此病人的正中門牙長寬比介於正常範圍中，不需調整牙齦線高度，因此側門牙的長寬比也根據統計上的平均數值 0.73 進行設計⁷。

由口內照片及口掃檔可見病人的兩顆側門牙型態不相同且排列位置不對稱，若需將此兩顆側門牙之診斷蠟形 (diagnostic wax-up) 製作成完全對稱的型態，是一大挑戰。根據 Jaafar Abduo 在 2016 年發表的文章，比較傳統堆蠟 (conventional wax-up) 與數位蠟型 (digital wax-up) 在型態上的對稱性，發現數位蠟型在統計上顯著的具有更佳表現⁸。此病例利用 Exocad 以及 meshmixer 兩種數位設計軟體，確保齒位 12 及 22 的蠟型不僅在大小上完全相同，型態上也可完全對稱。

數位設計軟體之應用已觸及牙科各個領域，包括陶瓷嵌體及牙冠的切削、植牙手術導板的設計製作以及隱形矯正數位排牙等等，其便利性及精準性可幫助牙醫師在臨床上得到更理想的治療結果，目前較少案例將數位牙科工具應用在複合樹脂直接填補上，此病例嘗試利用數位蠟型來代替傳統堆蠟，利用數位設計軟體中 3D 模型可複製的特點，可達成更準確的治療結果。

結 論

1. 對於釘狀齒的治療，利用矯正過程中側門牙近、遠心皆有牙縫間隙的時機來調整牙齒型態，可在蠟型設計上獲得較理想效果。
2. 對於釘狀齒等前牙美觀區的案例，使用數位牙科設計軟體來製作前牙數位蠟型，可以提升治療結果的準確性與對稱性。

參考文獻

1. Hua, F., et al., Prevalence of peg-shaped maxillary permanent lateral incisors: A meta-analysis. *American Journal of Orthodontics and Dentofacial Orthopedics*, 2013. 144(1): p. 97-109.
2. Shilbayih, H.A., N. Watted, and M. Abu-Hussein, Multidisciplinary aesthetic dental treatment; peg lateral with congenitally maxillary lateral incisors. *IOSR*, 2016. 15: p. 83-91.
3. Greenwall, L., Treatment options for peg-shaped laterals using direct composite bonding. *International Dentistry SA*, 2010. 12(1): p. 26-33.
4. ASMUSSEN, E. and E.K. HANSEN, Surface discoloration of restorative resins in relation to surface softening and oral hygiene. *European Journal of Oral Sciences*, 1986. 94(2): p. 174-177.
5. Poggio, C., et al., Surface discoloration of composite resins: Effects of staining and bleaching. *Dental research journal*, 2012. 9(5): p. 567.
6. Tan, B., et al., Effect of beverages on color and translucency of new tooth-colored restoratives. *Operative Dentistry*, 2015. 40(2): p. E56-E65.
7. Magne, P., G.O. Gallucci, and U.C. Belser, Anatomic crown width/length ratios of unworn and worn maxillary teeth in white subjects. *The Journal of prosthetic dentistry*, 2003. 89(5): p. 453-461.
8. Abduo, J., Morphological symmetry of maxillary anterior teeth before and after prosthodontic planning: comparison between conventional and digital diagnostic wax-ups. *Medical Principles and Practice*, 2016. 25(3): p. 276-281.
9. <https://www.speareducation.com/spear-review/2020/09/restoration-of-the-peg-lateral-the-direct-resin-approach> Particle abrasion (sandblasting) is carried out with 27-micron alumina at a pressure of around 2-3 bar. The aim is to remove aprismatic enamel and optimize bond strengths
10. <https://www.styleitaliano.org/making-a-patient-smile-with-diastrama-closure-a-minimally-invasive-approach/> Sandblasting the surface with 29µm Aluminium Oxide (AquaCare). The purpose of this step is cleaning and improving the bond strength.

The application of dental CAD software on direct composite resin filling of peg laterals: a case report

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Peg-shaped lateral teeth occur commonly and usually need the cooperation of restorative and orthodontic treatment. Detailed anterior teeth smile analysis and diagnostic wax-up before treatment planning would help to achieve a better result.

Using direct composite resin filling to reconstruct the morphology of peg laterals is by far the most conservative treatment option. Also, its material properties allow dentists to repair the resin restoration. Although composite resin is more easily discolored due to diet or plaque accumulation when compared with ceramic, good oral hygiene, proper polishing, and regular follow-up can maintain the color stability of the restoration.

In this case, dental CAD software was used to design the digital wax-up. Owing to the reproducibility of the 3D models, digital wax-up can enhance the accuracy and the symmetry of the morphology and let the treatment results of direct composite filling be more ideal.

Keywords: Peg lateral, CAD Software, Digital wax-up, Direct composite resin filling, Orthodontic treatment

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以金屬冠蓋體完成根管治療後近心傾斜 大白齒復形 – 病例報告

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對於根管治療後牙齒，由於齒質結構破壞導致強度下降，若直接復形，發生牙冠或牙根斷裂的風險較大¹，通常建議以固定假牙保護，在有些狀況下，亦可使用鑲嵌體或冠蓋體取代全固定假牙。本病例報告患者由於右下第一大臼齒過早脫落導致右下第二大臼齒近心傾斜，為避免前方小白齒阻礙假牙置入途徑，故以冠蓋體作為根管治療後之復形物，修形時避開近心部分並由頰舌側延伸至髓腔壁以提供足夠之穩定性及固持度，材質選擇考慮強度、抗磨耗性、生物相容性及患者經濟因素，最後採取以鈷鉻合金全金屬冠蓋體完成復形。在減少齒質切削程度及保護殘留齒質結構條件下，以冠蓋體完成根管治療後牙齒的復形，比起傳統固定假牙有更能令患者滿意的成果。

關鍵詞：冠蓋體、近心傾斜、根管治療後牙齒

前 言

由於第一大臼齒萌發時間較早，通常也是最容易有齲齒或過早脫落的情形，若第一大臼齒過早脫落喪失，常導致對咬牙的過度萌發及後方第二大臼齒的近心傾斜，有時更會形成咬合干擾或誘發顫顎關節障礙症 (Temporomandibular Disorders, TMD)²。而當第二大臼齒近心傾斜時，就會影響到日後補綴物的置入途徑，因此若傾斜之第二大臼齒發生嚴重齲齒或需根管治療，後續需要牙冠保護時就會遇到問題。一般來說，常見的

解決方法可利用矯正方式進行第二大臼齒扶正並製作固定假牙，但若無法進行矯正治療時，可採取另一方式，利用冠蓋體 (Onlay) 解決置入途徑的障礙，提供此牙齒的保護及咬合重建。

在治療這類的患者時，首先需要先檢查患者口內咬合狀況，同時必須注意患者是否有顫顎關節障礙或症狀，若有對咬牙過度萌發情形可先進行咬合調整，如有需要，可先印製模型進行分析與診斷，通過與患者的討論後執行治療計畫。

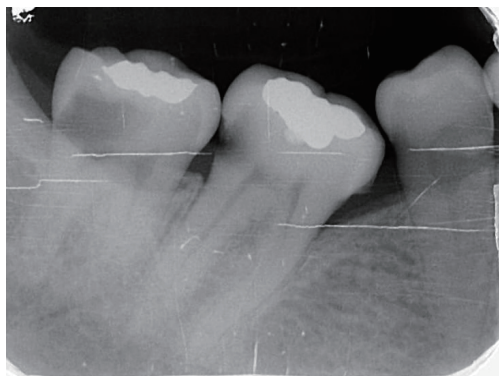
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圖一：右下第二大臼齒及第三大白齒遠心大範圍嚴重齲齒術前 X 光



圖二：右下第二大臼齒及第三大白齒遠心齲齒銀粉填補術後 X 光

本病例為 48 歲女性，主訴是右下第二大臼齒及第三大白齒區域牙痛，經過 X 光檢查可見兩者皆有嚴重之牙根齲齒，之前填補銀粉有部分剝落及變色，第二大臼齒舌側靠咬合面位置有細小裂痕，患者覺得咬東西會痛，經以銀粉重新填補，觀察二至三週後，右下大白齒區仍有嚴重冷熱敏感現象後，此後症狀逐日加劇，最後右下第二大臼齒後續因劇烈牙痛故先進行根管治療。患者於年輕時因第一大臼齒齲齒過早喪失導致第二大臼齒向近心傾斜，對於之後的假牙治療計畫由於患者不想接受矯正治療，最後通過診斷模型與患者討論後，患者選擇右下第二大臼齒根管治療後以冠蓋體復形。

病例

◎病患：48 歲女性患者。

◎主訴：

右下第二大臼齒及第三大白齒區域牙痛且有冷熱敏感。

◎過去病史：

無全身性疾病，亦無藥物過敏史。

◎過去牙科病史：

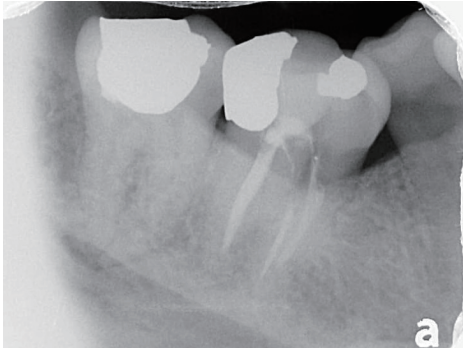
銀粉充填治療、樹脂填補、根管治療及固定假牙。

◎家族牙科病史：

拔牙、蛀牙填補。

◎口內檢查：

1. 右上第二小白齒及右下第一大臼齒喪失，右下第二大臼齒及第三大白齒向前傾斜。
2. 右上第一大臼齒有輕微過度生長情形。
3. 右下第二大臼齒及第三大白齒遠心大範圍嚴重齲齒，懷疑齲齒已經波及牙髓（圖一）。
4. 右下第二大臼齒舌側靠咬合面位置有小裂痕，患者覺得咬東西會痛。
5. 前方及側方運動時，後牙區無咬合干擾。



圖三：右下第二大臼齒根管治療後術後 X 光



圖四：右下第二大臼齒修形準備印模前

◎ 放射線檢查：

1. 右下第二大臼齒及第三大白齒遠心大範圍嚴重齲齒。
2. 右下第二大臼齒前傾，近心靠牙齦邊緣有殘存牙結石。
3. 右上第二大臼齒及左下第一大臼齒近心有牙周破壞。

◎ 診斷：

1. 全口慢性牙周炎。
2. 右下第二大臼齒及第三大白齒遠心大範圍嚴重齲齒。
3. 右下第二大臼齒齒髓炎。

◎ 問題所在 (Problem list)：

1. 右下第二大臼齒及第三大白齒遠心大範圍嚴重齲齒。
2. 右下第二大臼齒及第三大白齒向前傾斜。
3. 右下第二大臼齒舌側靠咬合面位置有裂痕，懷疑有裂齒症 (Cracked tooth syndrome)。

◎ 治療計畫 (Treatment plan)：

1. 全口牙周病治療。
2. 右下第二大臼齒及第三大白齒齲齒填補 (右下第二大臼齒有後續症狀)。
3. 右下第二大臼齒根管治療。
4. 經由矯正治療將右下第二大臼齒扶正後以固定假牙復形。若不能接受矯正治療，右下第二大臼齒可以冠蓋體或鑲嵌體 (Inlay) 完成復形。

◎ 治療摘要

2021/08/09

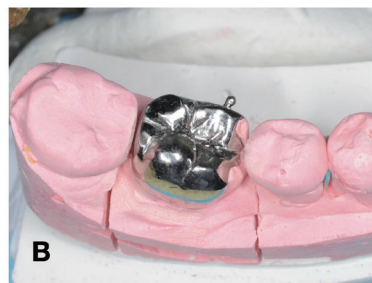
右下第二大臼齒及第三大白齒齲齒移除，無明顯齒髓曝露，以銀粉填補完成 (圖二)。

2021/08/26

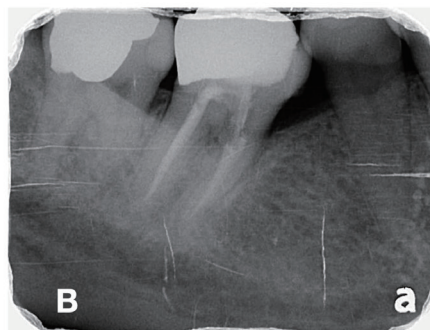
1. 全口牙結石清除及口腔衛生教導。
2. 患者覺得右下大白齒區冷熱敏感不舒服，建議觀察。



圖五：右下第二大臼齒以矽膠彈性印模材印模



圖六：(A) 冠蓋體完成檢視密合度
(B) 冠蓋體完成試戴準備黏著



圖七：(A) 冠蓋體口內以樹脂黏著劑黏著並檢查咬合狀況
(B) 冠蓋體黏著完成術後 X 光

2022/04/26

患者覺得右下大白齒區冷熱敏感加劇，先牙周緊急處理觀察。

2022/06/29

右下第二大臼齒劇痛無法入睡，開始進行根管治療。

2022/07/07

1. 右下第二大臼齒完成根管治療流程（圖三）。
2. 印製參考模型及取咬合紀錄。

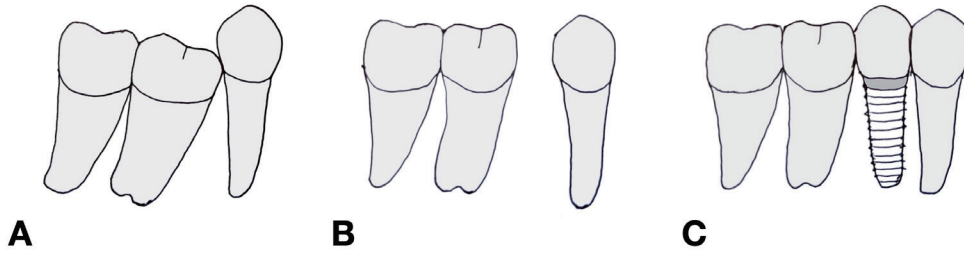
2020/07/16

1. 與患者討論治療計畫，由於患者不想做矯正治療，評估後決定以冠蓋體復形。

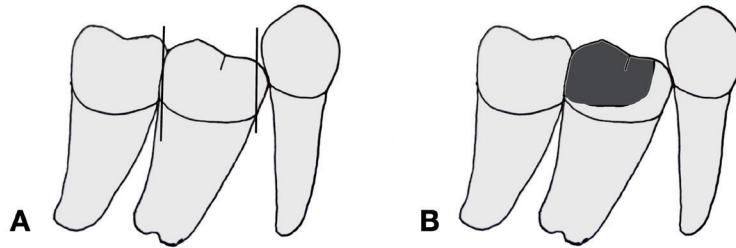
2. 右下第二大臼齒修形，髓腔底部以玻璃離子黏著劑填補（圖四）。
3. 以加成式矽化物 (condition silicone, 本次治療使用 Aquasil ultra, Densply Sirona, Milford, DE, USA) 印製主模型（圖五）。

2022/08/13

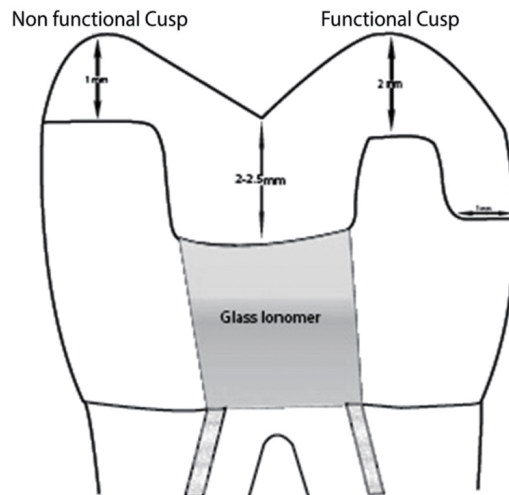
1. 完成之冠蓋體試戴，檢視密合度並準備黏著（圖六 A、六 B）。
2. 牙齒內部徹底清潔後後以雙重聚合型的樹脂型黏著劑 (RelyX U200, 3M, GER) 黏著，術後 X 光檢視成果（圖七 A、圖七 B）。



圖八：(A) 第二大臼齒及第三大臼齒近心傾斜圖示
(B) 第二大臼齒及第三大臼齒以矯正方式扶正後圖示
(C) 第二大臼齒及第三大臼齒以矯正方式扶正後，以植牙關閉空間圖示



圖九：(A) 第二大臼齒直接修形完成牙冠之角度示意圖示
(B) 第二大臼齒以冠蓋體完成復形圖示



圖十：根管治療後牙齒以冠蓋體完成復形設計圖示

討 論

對於根管治療後的牙齒處理方式，有許多種不同做法，而在決定復形方式前，牙齒本身結構的評估更為重要。研究顯示，在大白齒區根管治療後的牙齒在髓腔開擴後，即使邊緣嵴仍保持完整，牙齒整體強度大約降低 20%，但若有單側或雙側的邊緣嵴喪失，強度就會下降更多，甚至到 45~63%³，根管內的修形擴大或釘柱修形同樣會影響牙齒的強度^{4,5}。

根據牙齒結構的完整性，我們可以訂定不同的治療方式，思考用填補的方式，或者是進一步用固定假牙來保護牙齒⁶，如果根管治療後的牙齒在髓腔開擴後並未破壞兩側的邊緣嵴，以簡單的填補方式如運用樹脂或銀粉等即可完成治療，若可控制好填補物的強度及密封性，在長期的觀察下，仍能有令人滿意的成果⁷，但若有單側或者是雙側的邊緣嵴喪失，由於殘存齒質整體強度不足，必須要積極考慮使用更完善的治療方式，如全覆蓋式固定假牙做進一步的保護^{8,9}。

本病例的思考流程如下，由於下顎第一大臼齒過早喪失，導致第二大臼齒向近心傾斜移動並伴有第三大白齒近心前傾（圖八 A），首先可以利用矯正方式將第二大臼齒及第三大白齒扶正並往近心靠攏（圖八 B），此時再完成第二大臼齒的固定假牙即可，但如空間無法閉合，可能就須以牙橋或者是搭配人工植牙（圖八 C）來完成。但如果患者不願意修磨鄰接牙齒，另一可行方案是運用樹脂黏著牙橋 (resin bonded bridge) 完成右下缺牙區的重建，但若有大範圍的填補物或齲齒則不適合此治療方式。

若患者不願意接受使用矯正方式處理，這時候由於製作第二大臼齒固定假牙的置入途徑受到前方第二小臼齒的阻擋，直接修形將會損失很多齒質（圖九 A），同時也會削弱第二大臼齒的結構及強度，要解決只能運用鑲嵌體及冠蓋體的方式，避開前方牙齒的干擾，以此方法處理的方式具有許多優點，患者可以保留更多的齒質，補綴物邊緣對牙周的刺激更少，同時治療流程也更簡潔。

採用鑲嵌體或者是冠蓋體的選擇，需先評估此牙齒的齒質結構，若牙齒在根管治療後所殘餘的齒質結構強度不足，牙齒的邊緣嵴有缺損，或患者有夜間磨牙等狀況，建議考慮覆蓋咬頭的設計⁸，譬如冠蓋體。本病例之第二大臼齒由於在之前已經有大範圍的銀粉填補以及已邊緣齲齒，在根管治療過程中，已將所有的填補物及齲齒去除，而在遠心位置齒質結構也較差，故此病例後來決定以冠蓋體作為最終的補綴物（圖九 B）。

冠蓋體的設計，在根管治療之牙齒與自然牙並無不同，在前者的根管開口處，可先用玻璃離子黏合劑填補並將倒凹處封填完成，髓腔深度大約保持 2~2.5mm，覆蓋咬頭處厚度在功能性咬頭至少需 2mm 厚¹⁰（圖十）。至於材料的選擇，可由美觀性及功能性兩方面來考量，若選擇美觀性陶瓷，如玻璃陶瓷 (glass ceramic)，具有高透明度，但是強度較弱。粒子充填玻璃陶瓷 (Particle-filled glasses)，如加入二矽酸鋰強化玻璃陶瓷，相較於長石陶瓷 (feldspar ceramics)，擁有較佳的機械性質同時具有玻璃陶瓷的高透明度，因此兼具強度與美觀的需求，以上兩者輔以氫氟酸蝕合併矽烷 (silane) 處理陶瓷表面，皆可與齒質達到

良好的黏著強度。多晶陶瓷 (Polycrystalline ceramics)，如氧化鋯陶瓷 (zirconia ceramic) 則擁有更佳的機械強度，雖然透明度較差，但在後牙區並不影響美觀性，氧化鋯黏著時以氫氟酸酸蝕合併矽烷處理表面時效果不佳，可使用氧化鋁噴砂製造陶瓷表面的微觀結構 (microstructure)，再以樹脂黏著劑黏著¹¹。若以功能性考量的觀點來看，金屬材質，尤其是貴金屬或半貴金屬，一方面硬度與自然牙齒比較接近，第二方面其延展性及組織相容性也很優異，也能保留更多的殘留齒質，除了美觀性不佳，在機械特性上優於陶瓷，若以硬度更高的鈷鉻合金製作，牙齒的切削厚度可更為保守¹²。此病例最後因經濟因素考量，同時考慮耐用度及強度，決定以鈷鉻合金之冠蓋體完成復形，冠蓋體修形後邊緣不另行做出斜角 (bevel)，內面酸蝕處理後以雙重固化樹脂黏著劑 (dual cure resin cement) 黏著，術後回診狀況良好。

結 論

對於根管治療後的牙齒，齒質結構的評估及材料選擇，是治療成功的關鍵。根據患者的情況，與患者充分溝通，選擇可以保留最多齒質的設計，輔助細心地處理及黏著固定，非全覆蓋性質的冠蓋體與傳統固定假牙比較起來，在美觀性及功能性皆能達成良好的要求，對患者於醫師兩方面來說，乃是一個雙贏的局面。

參考文獻

1. Eliyas S, Jalili J, Martin N, Restoration of the root canal treated tooth. *Br Dent J* 2015;218:53-62.
2. Cordray FE, The Relationship between Occlusion and TMD. *Open J Stomatol* 2017;7: 35-80.
3. Reeh ES, Messer HH, Douglas WH. Reduction in tooth stiffness as a result of Endo-dontic and restorative procedure. *J Endod* 1989;12:512-516.
4. Lang H, Korkmaz Y, Schneider K, Raab W H-M . Impact of Endodontic Treatments on the Rigidity of the Root . *J Dent Res* 2006; 85: 364-368.
5. Fernandes AS, Dessai GS, Factors Affecting the Fracture Resistance of Post-Core Reconstructed Teeth: A Review. *Int J Prosthodont* 2001;14:355-363.
6. Motasum AA. A Modern Guide in the Management of Endodontically Treated Posterior Teeth . *European J Gen Dent* 2019;8:63-70.
7. Baba NZ, Goodacre CJ, Daher T, Restoration of endodontically treated teeth: The seven keys to success. *Gen Dent* 2009;596-603.
8. Hamdy A . Effect of Full Coverage, Endocrowns, Onlays, Inlays Restorations on Fracture Resistance of Endodontically Treated Molars . *J Dent Oral Hyg* 2015;1:1-5.
9. Lin J, Lin Z , Zheng Z. Effect of different restorative crown design and materials on stress distribution in endodontically treated molars: a finite element analysis study . *BMC Oral Health* 2020;20:1-8.
10. Homsy F, Eid R, GhoulcWE, Chidiac JJ, Considerations for Altering Preparation Designs of Porcelain Inlay/Onlay Restorations for Nonvital Teeth. *J Prosthodont* 2015;00:1-6.

11. Djuričić KO , Medić V, Dodić S, Gavrilov D ,
Antonijević D , Zrilić M, Dilemmas in Zirconia
Bonding: A Review, Srp Arh Celok Lek.
2013;141:395-401.
12. Banerji S, Mehta B, Millar BJ, Cracked tooth
syndrome. Part 2: restorative options for the
management of cracked tooth syndrome, Br
Dent J 2010;208:503-514.

Restoring a mesial tilting endodontic treated molar with metal onlay : a case report

*Yu-Chi Chang*¹, *Yung-Show Chiang*^{2*}, *Yu-Ting Li*^{3*}

It is always challenging in restoring an endodontic treated tooth when the tooth structure was weakened by access opening and caries removing procedure. Usually a full coverage crown can easily protect an endodontic treated tooth, but there are some situations that would make it more difficult to complete this procedure. For example, a mesial tilting molar, impacted by anterior tooth which blocked the path of crown inser-tion. In this situation, onlay or inlay might solve this difficult problem.

In this case report, we introduced the onlay restoration which is more suitable for the tilting molars. The tooth preparation of onlay, avoiding mesial impacted part, covering the bucal wall, lingual wall, distal proximal box, and extending into the chamber wall. It provides the retention and stability of this onlay restoration. The onlay material selection depends on not only the patient's choice, but also the tooth position, occlu-sal force, material strength, and biocompatibility. We chose cobalt-chromium alloy as our restoration material, which shows high strength and good wear resistance, and the smaller clearance needed for the onlay restoration .

Eventually, we can protect the remaining tooth structure of an endodontic treated tilting molar by the conservative tooth preparation with a full metal onlay restoration.

Keywords: Onlay, Mesial tilting, Endodontic treated teeth

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申請類別	<input type="checkbox"/> 一般會員 【原相關會員 No : _____】 請依資格勾選申請條款 (可複選) <input type="checkbox"/> 第一款 <input type="checkbox"/> 第五款 <input type="checkbox"/> 第二款 <input type="checkbox"/> 第三款 <input type="checkbox"/> 第四款		<input type="checkbox"/> 相關會員 <input type="checkbox"/> 學生會員 <input type="checkbox"/> 名譽會員 <input type="checkbox"/> 贊助會員		
備 註	請依符合之款項附相關證明文件 (影印即可/A4 統一規格) <input type="checkbox"/> 1. 學歷證明 <input type="checkbox"/> 2. 牙醫師證書 <input type="checkbox"/> 3. 在職證明 (學生會員請出具在學證明或學生證)	審 查 結 果 (此欄由 審查委 員填寫)	<input type="checkbox"/> 通 過：成為本會 ☆一般會員 No : _____ ☆名譽會員 No : _____ ☆相關會員 No : _____ ☆贊助會員 No : _____ ☆學生會員 No : _____ <input type="checkbox"/> 不 通 過：_____		
申 請 人	(簽章)				
申 請 日 期	中 華 民 國 年 月 日				

歡迎使用學會網站 (<http://www.taod.org.tw/>) 線上入會申請。

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