Proactive adoption of Align™ Oral Health Suite on iTero™ Scanner for presentation of findings in routine consultation to drive patient engagement and profitability.

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Dr Tse lectures internationally on Implant and Aesthetic Dentistry and is a Master and Global Instructor of Digital Smile Design (DSD). He is an honorary assistant professor in University of Hong Kong and has published numerous articles in dental journals, including collaborations with John Kois. Currently, he is the Vice President of the Chinese Academy of Esthetic Dentistry (CAED) and chairman of its Accreditation Board. Since 2004, he has been practicing privately at Perfect Smile Clinic in Hongkong.

1. Introduction

Making the first impression: Building trust in modern doctor-patient relationships

Establishing trust in the dentist-patient relationship is a critical aspect of modern dental practice. As the patients become increasingly informed and discerning, the dynamics of this relationship have evolved significantly. Trust is fundamental for effective communication, patient satisfaction, and adherence to treatment plans. The patient needs to feel confident that their dentist is not only skilled but also genuinely cares about their well-being.

This trust is cultivated through clear communication, empathy, and transparency. Many patients visiting dental clinics are unaware of their oral health status, often seeking care only when faced with discomfort or pain. Conversely, millennial patients frequently come equipped with extensive online research, expecting not just clinical solutions but also a seamless experience characterized by efficiency, comfort, and transparency. This generational shift necessitates a focus on succinct patient education, as both demographics may have limited time for lengthy consultations.

Effective communication is paramount in fostering trust. This can be fostered by engaging patients to express their concerns and preferences openly. It not only helps in understanding patient needs but also reassures them that their voices are valued in the decision-making process.

Patients often come with varying levels of understanding regarding dental terminology, making it challenging to explain procedures and treatment options using traditional methods. To address this, dental practices can utilize visual tools to simplify complex concepts and reduce anxiety. This approach enhances communication about treatment options and needs, ultimately boosting patient trust and satisfaction which is vital for maintaining loyalty leading to profitability in an increasingly competitive market.

As millennials prioritize immediate satisfaction and often view oral health as a secondary concern, practices must adapt to these changing attitudes by fostering open communication and providing clear, accessible information about dental care. By leveraging technology to build initial connections and maintaining transparency over time, dentists can

cultivate lasting relationships that lead to improved patient satisfaction and health outcomes.

First mover advantage: Bridging barriers to digital adoption for dental consultations

A recent investigation by Alotaibi and Kassim., (2023) into the factors that drive the adoption of digital dental technologies and informatics posited that "Potential adopters want to know the degree to which a new idea is better than an existing one." This concept underscores a pivotal stage in the decision-making process concerning the integration of new technologies into practice. Hameed et al., (2012) outlined two primary pathways for organizations to adopt new technologies and innovative practices:

1. As a response to changes in the external environment, or
2. Through proactive integration of innovative practices anticipated to be necessary for future operations.

As a practitioner, I have chosen the latter approach, actively adopting technology to provide compelling evidence and comprehensive education to my patients. I utilize the Align™ oral health suite, which is exclusively available on iTero™ scanners.

To address the trust gap, clear communication through iTero visuals became a crucial part of my consultation process. By employing technological aids one can enhance transparency and understanding, enabling patients to navigate complex information and foster confidence in our diagnoses and treatment plans. The use of visual aids and clear explanations through digital technologies significantly improves patients' comprehension of their options and potential outcomes, thereby increasing their trust in our care.

As dentists we have a unique opportunity to reshape our practices to align with evolving patient needs. Embracing advanced digital solutions is essential for enhancing patient experiences, rebuilding trust, and improving operational efficiency.

This clinical paper will illustrate how Align™ Oral Health Suite interface and various visualization applications available on iTero™ scanner are implemented at the Perfect Smile Dental Clinic. Through practical examples and insights, we aim to showcase how adopting this technology can address the gaps inherent in traditional analog methods, particularly in scenarios where patients struggle to understand model markings or X-ray interpretations. This transformation is vital for modern dental practices striving to meet contemporary patient expectations.

Revolutionizing consultation workflow with Align Technology's digital solutions

I started using iTero scanners for risk assessment in April 2022, and when the Align™ Oral Health Suite was launched a year later, it aligned perfectly with my innovative approach. Once patients are under oral health assessment, various diagnostics tools including intraoral scanning (IOS) are used to analyze their oral conditions. The adage “seeing is believing” is often a very fundamental belief system in humans; patients are more likely to trust and accept the diagnoses and treatment plans after they can visualize their oral health assessment. Furthermore, a patient's decision to accept treatment is significantly influenced by their relationship with their dentist, which takes precedence over considerations about cost and time (Kalsi and Hemmings., 2013). The primary advantage of IOS technologies like iTero™ Element scanners is that the oral health conditions can be visualized and communicated with patients at the chairside

concurrently in real time. When using IOS, while scrolling over different angles of oral health components, I can clearly explain the current oral condition to patients, potential issues, and possibly share the treatment plans if needed.

2. Innovative digital interface empowering practices through clinical consultation framework

The Align™ Oral Health Suite on iTero™ Element scanner is a comprehensive digital interface (Figure 2) designed to elevate dental consultations and drive treatment-acceptance. It offers an innovative clinical framework that empowers dentists and their staff to conduct thorough oral health assessments using a single scan, patient-friendly terminology, and highly engaging visuals.

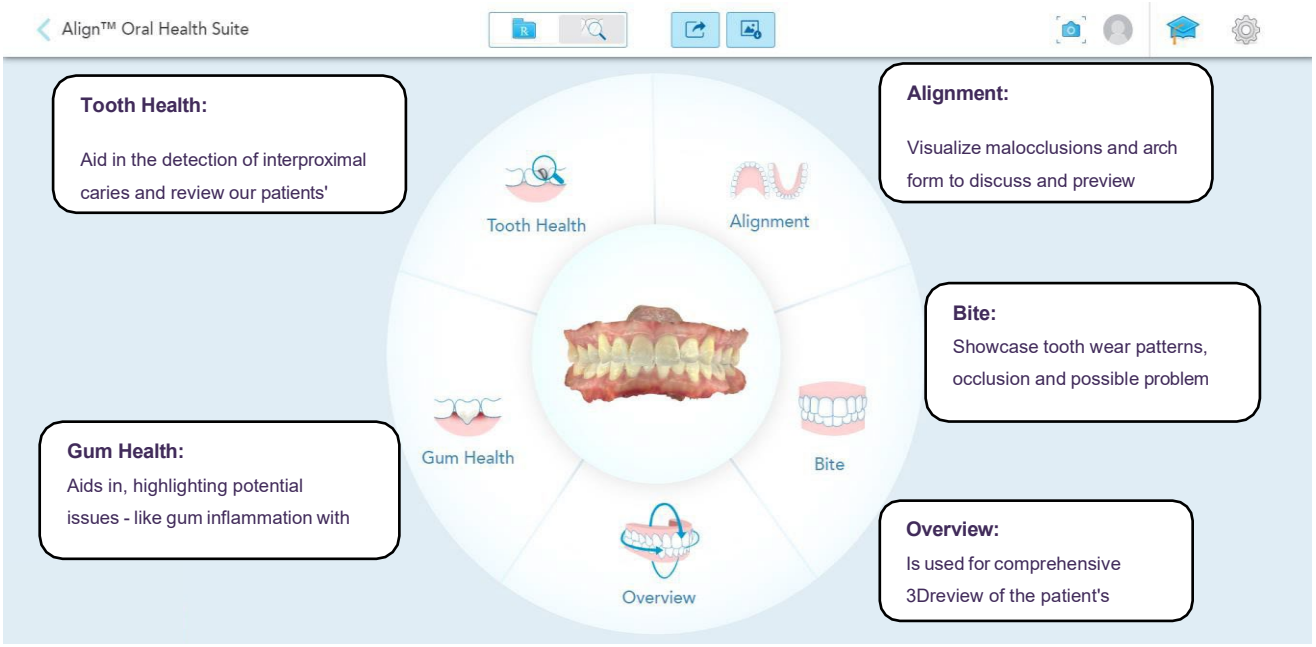

Figure 2. Align™ oral health suite for holistic oral health checks and consultations

2.1. Clinical case 1

(a) Magnified visualization of dental issues

One of the most significant benefits of the Align™ Oral Health Suite is its enhanced diagnostic capabilities. The technology offers magnified visualization of dental issues, particularly for composite fillings (Figure 2.1a). Composite restorations are widely used in dentistry due to their aesthetic appeal and minimal invasiveness and are a reliable option for dental repairs. However, their longevity is influenced by several factors including curing techniques, material properties, operator skill, and patient-related factors, such as caries risks (Demarco et al., 2023). Thus, necessitating examination during dental reviews.

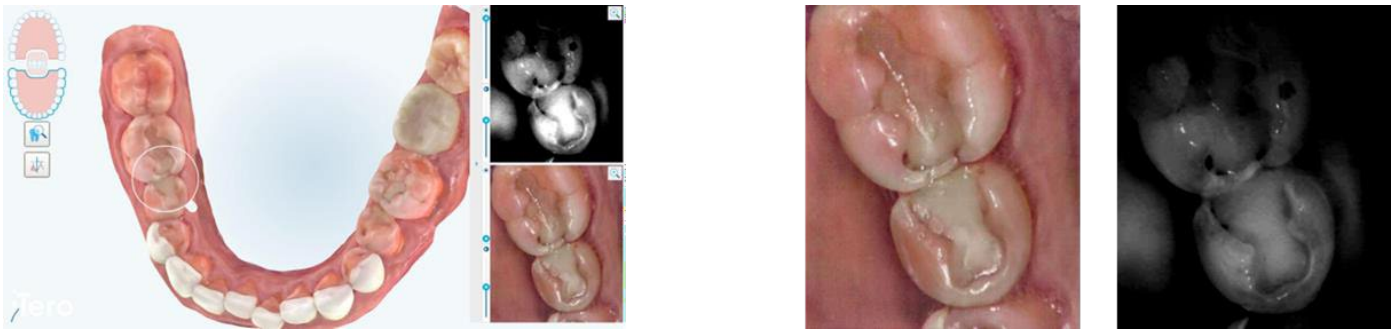

Figure 2.1a. Magnified visualization of failing old composite restorations and marginal leakage in composite fillings using intra-oral scans and NIRI

As illustrated in the graph (Figure 2.1b), service income from composite fillings rose by **12% in 2022**, **14% in 2023**, and a remarkable **33% in 2024** compared to 2021.

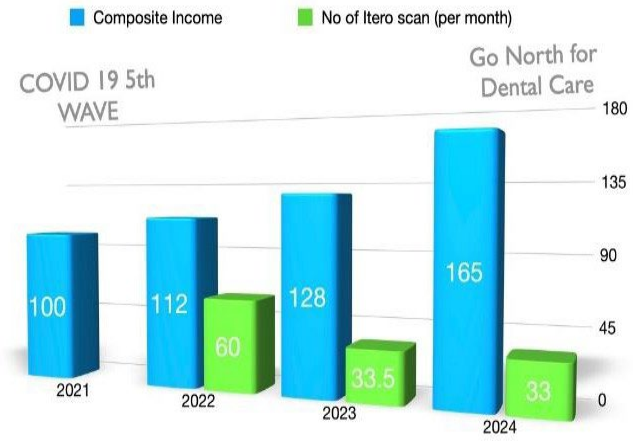

Figure 2.1b. Oral health assessment workflow introduced by Dr. Tse as part of his overall practice workflow

This increase is particularly significant considering the challenges the dental industry encountered in 2023, when numerous patients opted to travel to Shenzhen for more affordable dental care, driven by aggressive marketing strategies in Hong Kong.

Consequently, dental clinics experienced a gross income drop of 30% to 50%. Even as a premier practice, I felt the impact of these economic changes alongside the migration of patients to the UK and Singapore. Nevertheless, the iTero™ system has played a crucial role in maintaining the quality of care I provide. Despite these hurdles, the iTero™ scanner has been instrumental in upholding the quality of care I deliver.

2.2. Clinical case 2

(b) Presenting worsening tooth wear and enamel loss with timelapse functionality

Another groundbreaking feature of the iTero™ system is its iTero™ TimeLapse technology functionality. This feature facilitates effective monitoring of tooth wear, which is often overlooked in traditional assessments. By distinguishing between active and passive wear, both clinicians and patients gain valuable and crucial insights into dental health. The visual comparisons over time not only enhance the understanding of treatment needs but also motivate patients to seek or pursue necessary interventions.

Worn dentition is very common nowadays. For instance, an attritioned anterior tooth has been identified (Figure 2.2a), yet the clinician may be uncertain whether this wear is active or passive.

Here, iTero™ TimeLapse technology plays an important role for diagnosis. The clinician conducts an initial scan to establish a baseline and then performs another scan 18 months later. Analysis of the iTero™ TimeLapse technology data reveals a change of **0.05 to 0.2**

mm in the 12-22 region, indicating active wear (Figure 2.2b). In contrast, natural wear typically does not exceed **11 microns per year** (Loomans et al., 2017).

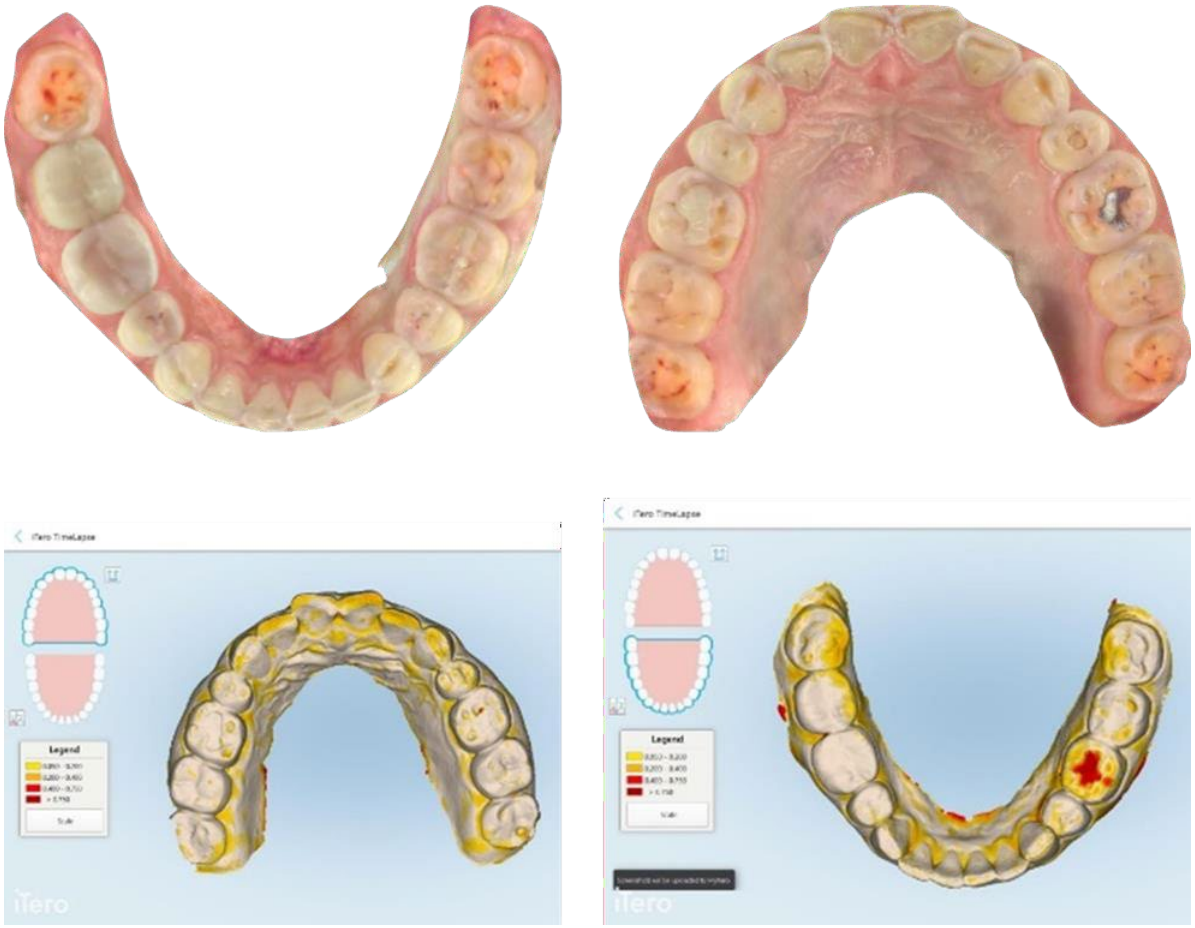

Figure 2.2 a & b. Active attrition in the upper anterior teeth and cusp wear in posterior teeth visualized as yellow highlights through the iTero™ TimeLapse technology functionality

2.3. Clinical case 3

(c) iTero scan enables two-way communication during oral health examination, crucial for dentist-patient relationship

As mentioned earlier, effective communication is crucial for building trust, particularly through two-way interactions. The iTero™ system has redefined the patient experience by enabling collaborative examinations and evaluation. It allows patients to share their concerns and preferences by maneuvering scanner visuals, engaging them in the assessment process alongside their clinicians. This interactive process fosters a sense of involvement and understanding, making patients feel more empowered about their oral health.

This is an interesting case involving a middle-aged woman who expressed concerns about lower anterior crowding, that was affecting her overall smile. She initially came to me for a consultation 10 years ago, seeking veneers; however, she did not proceed with treatment and instead explored other options, including consultations with a prosthodontist. Last year, she returned as her situation had worsened. She requested the extraction of tooth 41 and expressed interest in using bridgework to replace it (Figure 2.3a).

Figure 2.3 a: Patient requested extraction of 41 and bridge to replace it

The ability to draw and annotate on iTero™ scans is exceptionally useful when conveying complex issues. Using this exceptional feature, I was able to simplify otherwise complex information and explain to her about the pulpal damage and the aesthetic failure resulting due to the small size of Pontic 41 if we go ahead with bridgework (Figure 2.3b).

Figure 2.3 b: Drawings on 42 & 31 enabled explaining that short clinical crowns will lead to high chance of pulpal damage if used as abutment for bridgework to rehabilitate extracted 41

The scanner versatility allows me to present the iTero™ scan from different angles to explain. The key point presented was that the bite is a concern; tooth 41 was shortened due to attrition, and it cannot be lengthened without aligning the upper teeth (Figure 2.3 c). This is crucial as the lower restorative work will not alter the antagonist contact points and forces acting on the teeth without addressing these underlying bite issues.

Figure 2.3 c: Co-examination of anterior tooth #41 reveals worsening attrition, which may jeopardize the success of any restorative procedures unless prior alignment is achieved.

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These annotation and detailed drawings on iTero™ IOS effectively illustrated the drawbacks of bridgework and clarified that lengthening tooth 41 was not feasible due to her bite. This assisted the patient in making an informed decision. After illustrating these points, the patient gained a clear understanding of her situation and grasped the necessity of an aligner. This led her to agree to the ABC treatment approach, which includes Invisalign® for alignment, bleaching, and composite enhancements. Additionally, the use of Invisalign® Outcome Simulator Pro played a crucial role in motivating her final decision (Figure 2.3d).

Our hour-long discussion, enriched by the iTero™ visuals, allowed her to comprehend her oral condition and the viability of various treatment options. The transparency of our co-examination fostered trust, ultimately leading her to commit to the ABC approach.

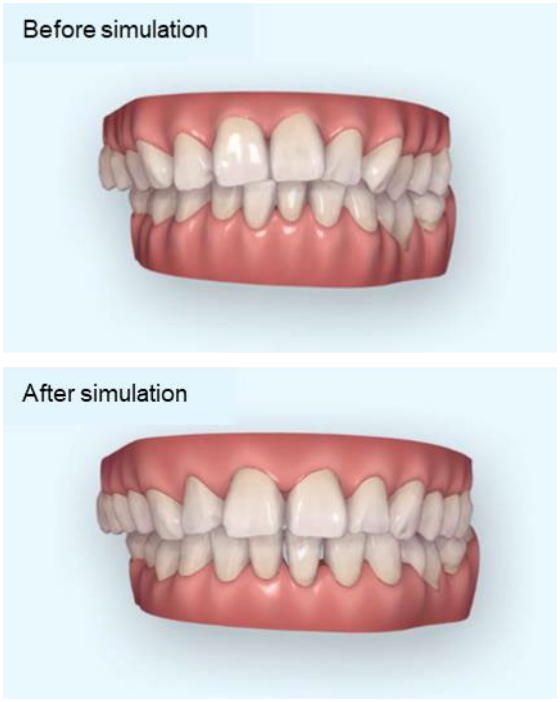

Figure 2.3d: Invisalign® Outcome Simulator Pro is simulation software on iTero™ scanner that allows clinicians to present potential treatment outcomes driving patients' confidence in proposed approach

The patient has initiated treatment with Invisalign® during the alignment phase, and the images below (Figure 2.3 e & f) demonstrate the impact of bite correction. Achieving results that closely resemble the projected outcomes from simulations further enhances confidence in the clinician's expertise. It is crucial to incorporate technology with thorough research and substantial datasets

Figure 2.3e: Patient dentition before and after Invisalign® treatment

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Figure 2.3f: Patient dentition after correction of anterior occlusion # 41, up righting of social six after alignment phase by Invisalign®

2.4. Clinical case 4

(d) Assessing and presenting functional risk with iTero™ Occlusogram functionality

The iTero™ Occlusogram helps patients clearly see heavy occlusion within their dentition which can lead to repeated failures in restorations. This visualization may encourage patients to consider more comprehensive treatment options, beginning with orthodontic care to address their underlying malocclusion before redoing any restorations. Such an approach drives long-term patient satisfaction.

A 65-year-old woman visited my clinic and requested replacement for her teeth numbered 25 and 46. Following an intraoral scan, we used the scan data to explain her current dental condition. She has severe erosion and attrition in her anterior teeth which she acknowledged as a major concern regarding her dental health (Figure 2.4 a).

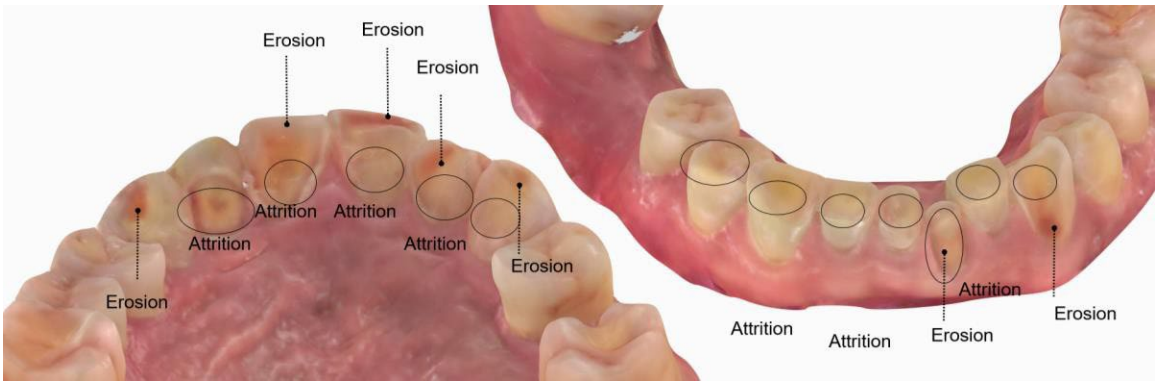

Figure 2.4a: A 65-year-old lady exhibited significant erosion and attrition in upper and lower anterior teeth

The use of iTero™ Occlusogram allowed her to visualize the heavy occlusion affecting her lower anterior teeth. The red area in the anterior region indicates excessive contact when she bites together (see Figure 2.4b), posing a risk for the success of any restorative procedures. She recognized and understood the need for comprehensive treatment, beginning with orthodontic intervention to correct her

bite and create adequate space for restoring her front teeth. Additionally, the iTero™ Occlusogram provides insights into bite force, malocclusion, and arch contact relationships. These functionalities are instrumental in detecting cracks and visualizing trauma as well.

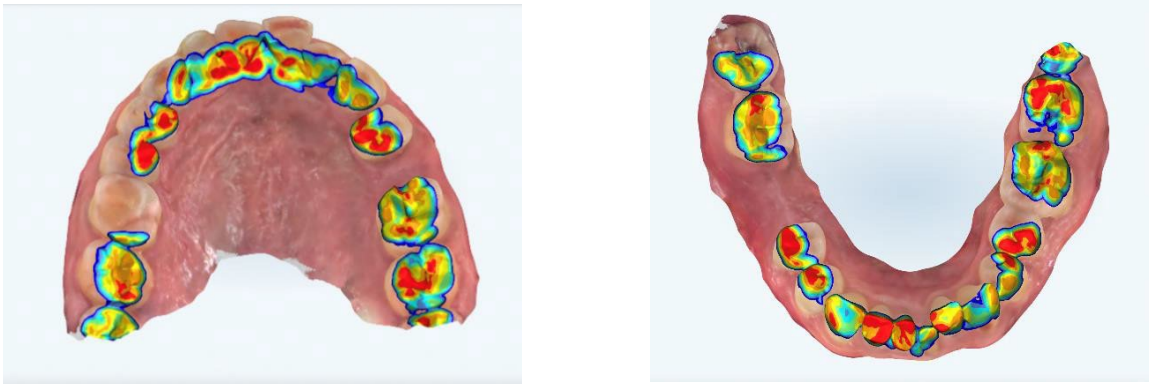

Figure 2.4b: The iTero™ Occlusogram presents a heat map, red color highlights patient's heavy contact points in the anterior region, while blue shows no contact between the arches.

2.5. Clinical case 5

(e) 850 nm infra-red wavelength in iTero™ NIRI technology for routine screening of biomechanical risk

In just one single scan, various types of information can be captured within minutes and visualized on-screen for communication with patients. The iTero™ NIRI (Near Infra-Red Imaging) technology aids in the early detection of enamel interproximal caries, demonstrating a sensitivity that surpasses traditional bite-wing X-rays by 66% for identifying proximal lesions (Metzger et al., 2022). (Figure 2.5a) The patient had two bitewing X-rays, which revealed incipient lesions in teeth 36, 37, 46, and 47. However, during the iTero™ NIRI technology (Near Infra-Red Imaging exam, it showed that tooth 46D has a significant carious lesion that extends mesiodistally and down to the dentin. From the intraoral photo, the caries appears to be deep and large (Figure 2.5b). If left untreated, the caries may progress to the pulp within two years before the next bitewing exam. It is fortunate to have iTero™ NIRI technology to detect this significant lesion.

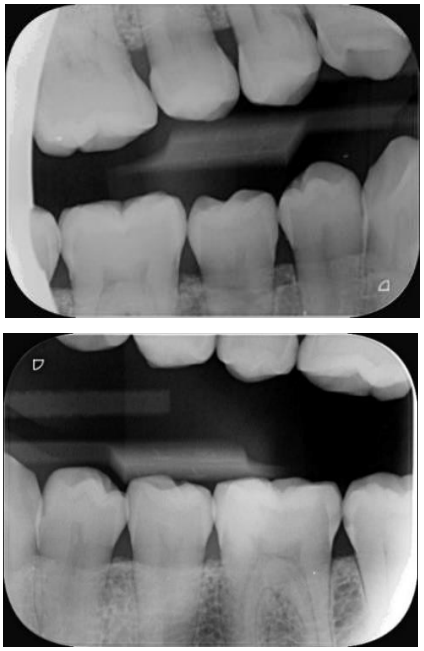

Figure 2.5 a: Two bite wings X rays showing incipient lesions on 36, 37, 46 & 47

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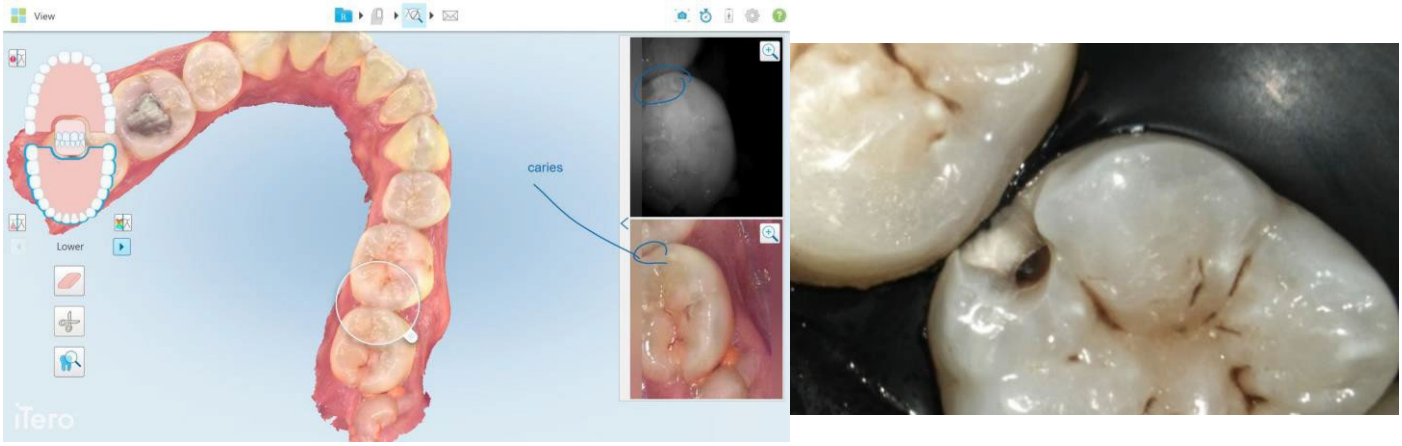

Figure 2.5 b: The iTero™ NIRI technology (showing significant interproximal caries on 46(D), which were not evident upon clinical examination and bite wing radiograph.

In clinical studies, it demonstrated an **88.6% accuracy** in detecting early enamel lesions compared to the lower sensitivity of bitewing radiography, which often misdiagnoses carious lesions. Unlike bitewing radiography, which exposes patients to ionizing radiation, iTero™ NIRI technology (Near Infra-Red Imaging) uses reflected near-infrared light. This allows for repeated use without the associated risks of radiation exposure, making it a safer option for both patients and practitioners

In cases where iTero™ NIRI technology detects early demineralized interproximal lesions that lack any visible discoloration and typically do not show up on bitewing X-rays (Figure 2.5 c). If these active lesions appear white, with the enamel losing its normal shine but without cavitation, I will implement preventive treatment through the caries infiltration method. Caries infiltration is a micro-invasive approach specifically targeting smooth-surface and proximal non-cavitated carious lesions, effectively minimizing unnecessary loss of healthy dental tissue to traditional operative treatments. As cariogenic acids attack the enamel, they extract minerals, resulting in porosity within the tooth structure. The caries infiltration method involves sealing these porous areas to prevent further acid penetration into the lesion and to halt caries progression at an early stage.

Figure 2.5c: A case showing bright NIRI demineralization in upper 14-15 while no obvious detection of established interproximal caries on Bitewing X rays.

Figure 2.5c: A case showing bright NIRI demineralization in upper 24-25 and 34-35 while no obvious detection of established interproximal caries on Bitewing X rays.

Clinically, even minor enamel cracks can lead to significant and irreversible damage to dental tissue, resulting in issues such as dental decay, increased tooth sensitivity, and potential tooth splitting. Additionally, these enamel cracks are prone to staining, which can compromise the aesthetic appearance of teeth. In a clinical setting, the ability to detect enamel cracks during chair-side examinations can greatly aid dentists in diagnosing conditions and developing treatment plans aimed at preventing associated dental diseases.

A study conducted by Zheng et al., in 2021 focused on creating a dental imaging system utilizing a near-infrared (NIR) light source for the detection of enamel cracks found that a wavelength of 850 nm demonstrated effective performance in identifying these cracks and has good clinical practicability

Align™ Technology does not officially endorse the use of the NIRI tool in this manner. However, leveraging my understanding of the underlying sciences and wavelengths, I have adapted its application to identify cracks in conjunction with intraoral images and symptom presentations (Figure 2.5 d).

Figure 2.5d: iTero™ NIRI technology and intra-oral scan used to identify crack present in between distobuccal & distolingual cusps of tooth 46

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2.6. Clinical case 6

(f) Empowering Patients: The Influence of In-Face Visualization on Dental Treatment Choices

The scans can be utilized, if necessary, to illustrate the requirements for orthodontic treatments to patients. Particularly with certain iTero scanner models, the anticipated treatment outcomes can be visualized at the chairside using an application known as Invisalign® Outcome Simulator Pro. This application features integration with wide smile photos, allowing patients to see a facial representation of their potential Invisalign® results. This capability significantly enhances the acceptance rate for orthodontic treatment.

This lady visited my clinic with a chief complaint of brown stains in front teeth. Following scans, other findings like over-erupted 12, deep bite and left deviation of midline was clarified to the patient highlighting the need for alignment (Figure 2.6 a)

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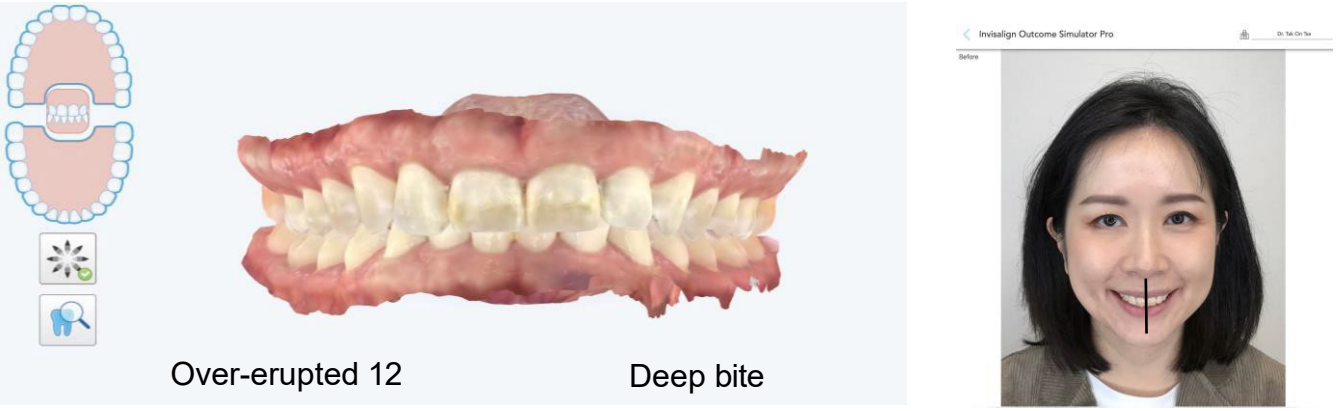

Figure 2.6a: The intra-oral scan viewer and in face visualization was used to present deep bite and left deviation of midline.

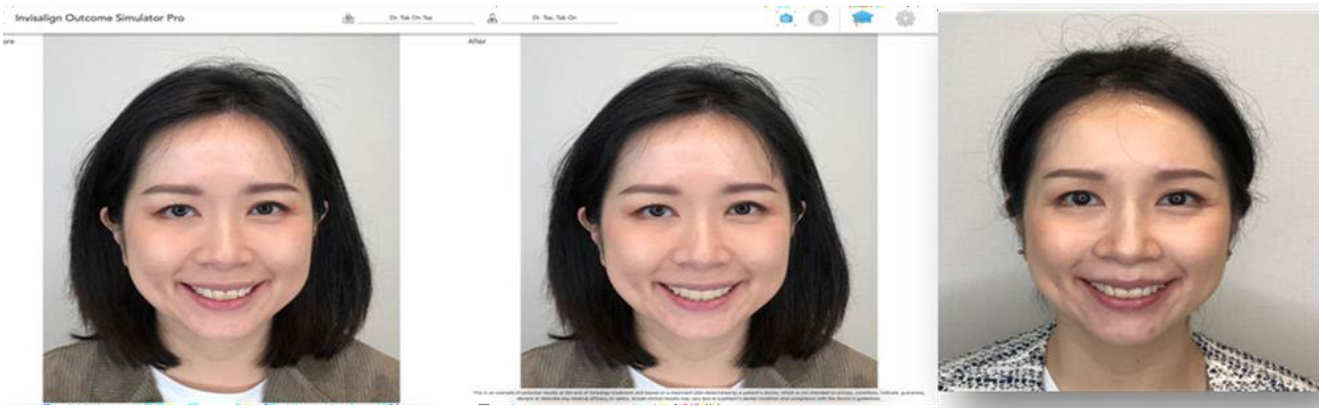

Figure 2.6b: The intra oral scan and wide smile photographs is used to simulate in-face Invisalign® outcome using Invisalign® Outcome Simulator Pro. The rightmost picture shows patient photograph post Invisalign treatment

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(g) Improving transparency & decision making by keeping patients informed through iTero ™ scan report

The strength of AOHS in the iTero Element™ scanners is the scan report feature, which consolidates a patient's oral health images and annotated data into a single document that can be sent directly to the patient's email or mobile device (Figure 2.6c). This capability gives iTero Element™ an edge over mirrors and transilluminators, which are far more affordable.

It is the report and shared communication with patients that help clinicians build stronger relationships with patients. Additionally, this practice enhances patient awareness regarding oral health management, allowing them to better understand and value the additional time and resources dedicated to their assessments.

Visual aids and tangible copies of their oral conditions help patients grasp their dental issues, leading to greater acceptance of diagnoses and treatment plans. Furthermore, this approach serves as a proactive measure to alert patients about potential dental risks, educate them on necessary care for their oral health, and ultimately mitigate the liability faced by dental professionals.

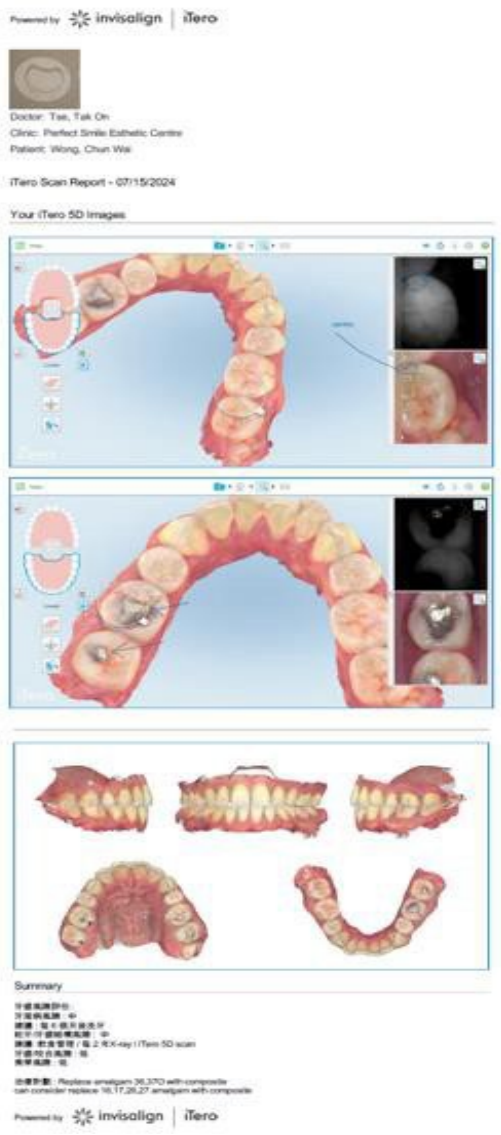

Figure 2.6c: A sample of iTero™ scan report that keeps patients informed and engaged beyond dental chair and even communicate their oral health with decision makers at home.

Conclusion

Balancing quality of care and practice efficiency becomes a question for almost every dental professional. Having a long-term relationship with patients is ideal even for dental professionals, but prolonged hours at the clinic are exhaustive and it requires additional resources and manpower. Thankfully, digital technologies in dentistry have evolved so that multiple clinical conditions can be diagnosed with efficiency. The perception that oral health needs to be checked by clinicians only when there are identified symptoms makes it hard for patients to develop a long-term relationship with dental clinics, resulting in transactional types of patients. The problem with this approach is that often patients wait until they develop serious oral diseases which may require restorative treatment and cause anxiety about dental treatments and clinic visits (Armfield and Heaton., 2013*)*. Personally, I categorize this practice pattern as a “Hitman” approach which is to find out the disease in a routine dental appointment that was not present six months ago, followed by treating the problem. However, the adoption of new digital technology into practice may result in practice style

changes and steep learning curves for dental professionals, especially due to digital literacy. Often, clinicians find it difficult to develop new skills or develop their practice due to time constraints and staff training, resulting in limited benefits despite significant investments (Mascitti and Campisi., 2020). In addition, patients in the digital era prefer to have autonomy in the dental treatment decision-making with more understanding of their oral health conditions to accept any diagnosis or treatments and manage their oral health (Benecke et al., 2020).

The Healer approach vs hitman approach

In contrast, there is another practice style that implements a risk assessment strategy to provide proactive care and develop a long-term relationship with patients: a healer approach. The latter method is through evidence-based evaluation and made recommendations based on diet, homecare habits, and other preventive measures and monitoring to minimize the potential risk of dental problems.

Preventive dental care is indeed found to be cost-saving and effective at achieving better oral health conditions overall (Pourat et al., 2018). The concept closely resembles the periodic vehicle (automobile) inspection or regular health screening. Dental health also needs to be checked on a regular basis so that patients can take better care of their oral health. Some common problems that can be detected early and prevented include the following: periodontal, biomechanical, functional, and dentofacial issues. The concept of diagnostic options is like the vehicle inspection categories. Ultimately, my goal as a healthcare provider is not to upsell treatments but to present the facts regarding patients' oral conditions transparently. The Align™ Oral Health Suite serves as an excellent communication tool, allowing me to explain current situations clearly. Patients appreciate the thoroughness of their oral health assessments, which builds trust and encourages proactive decision-making regarding their treatment.

In conclusion, the Align™ Oral Health Suite has significantly enhanced clinical outcomes while improving patient engagement and satisfaction in my practice. Its advanced diagnostic capabilities, patient-centric features, and effective communication tools have transformed my approach to dental care, ensuring that my patients receive the highest quality of treatment.

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