

WHAT WOULD **YOU** DO?

To REDUCE or NOT to REDUCE ?

F U L L A R C H P A R A D I G M S H I F T

A CASE REVIEW

MARK KWON, DMD

BONE-REDUCTION... IS IT NECESSARY?

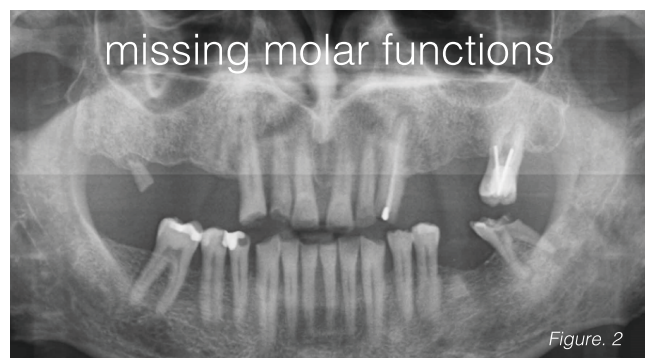
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FULL ARCH PARADIGM SHIFT

Full arch therapy. It is the 'FINAL FRONTIER' of Dental Implantology. Many of us have taken this journey, yet we are still looking for better solutions. In fact, over the past few decades many modalities have been employed. Examples include removable locator over-dentures, bar-over dentures, and even the most demanding of all approaches - the full arch fixed solution. Of late, the 'All-on-X' concept dominates the market. With its mere simplicity in treatment planning and surgical execution, it is no surprise that many implant surgeons, myself included, readily adopted it. Over the years, many of us incorporated the 'All-on-X', immediate load concept as one of our frequent 'go-to' solutions for the majority of our full arch fixed therapies. However, this chosen solution comes at a painfully enormous cost - BONE REDUCTION.

With the advancement in digital technology today, we can now predictably Plan and Execute both surgery and prosthetics. We do so to achieve the most minimally invasive, 'Biologically-driven' solution. This is particularly beneficial in the world of full arch therapy. Welcome to the world of ZBR (Zero Bone Reduction) FP1, a Full Arch Revolution!





subject: 55 year old healthy male

cc: “all my upper teeth are hurting and failing.

I hate my partial dentures.

I want to chew better again.”

If this was your patient, what would you do? Better yet, if this was your own mouth, what would YOU do? Of course, as there are many ways to cook an omelette, so are the ways to do full arch implant therapy. However, as a clinician, sometimes, we must make a difficult choice, a choice that we believe to be the right choice.

If this patient walked into my clinic, 5 years ago, i can honestly say, without a doubt in my mind, that I would have suggested an 'All-on-X' solution.

I would have measured up the patient's maximum smile line, ordered-in a bone reduction guide/stent, and performed aggressive alveolar bone reduction.

**“The ultimate goal of dentistry...
is to regain form and
function in a minimally
invasive manner
without irreversibly damaging
the surrounding biological
architecture...”**

A CASE REVIEW(CONT...)

Depending on the case, the amount of bone reduction can vary vastly. In our attempt to hide the transition line and achieve a favourable cosmetic outcome, a fully dentate patient would often be sentenced to an aggressive bone reduction procedure (Fig. 4).

The 'All-on-X' concept had several advantages over the traditional 'crown-and-bridge' fixed implant solution. They included:

- 1. Use of fewer implants (often 4 implants only)
- 2. Avoidance of sinus grafting (via tilted implants, Fig. 6)
- 3. Ease of surgery by utilizing MUA (Multi-Unit-Abutments) for angular corrections (Fig. 6)
- 4. Immediate loading of screw-retained denture prostheses (Conversion of denture into fixed bridge, Fig. 5)
- 5. Relative low cost for Fixed Hybrid Prosthesis fabrication (compared to the Crown-and-Bridge Porcelain Fused to Zirconia prosthesis)

In short, when 'All-on-4' was first introduced during the late 90's, it was a paradigm shift for those of us looking for an easier, more predictable and marketable full arch solution. Did I just say late 90's? Yes, indeed. This 'All-on-X' concept is over 20 years old. It was revolutionary 20 years ago. However, by today's standards, there is nothing spectacular about it.



Figure. 4 : sometimes an aggressive bone reduction was performed



Figure. 5: conventional 'All-on-X' concept requiring alveolar bone reduction to ensure optimal cosmetic outcome.

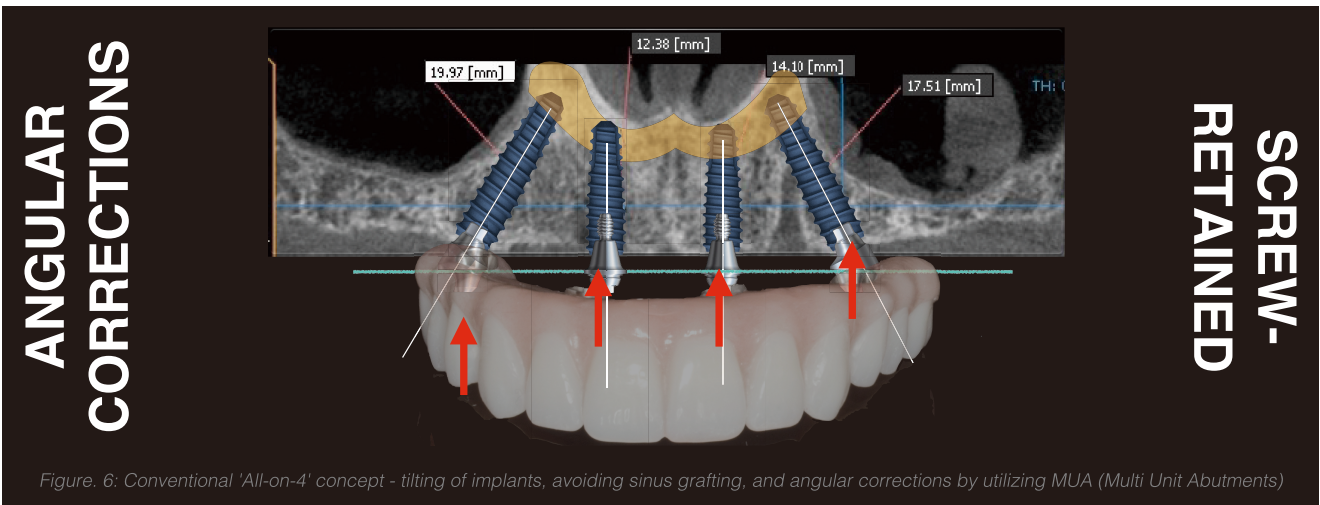


Figure. 6: Conventional 'All-on-4' concept - tilting of implants, avoiding sinus grafting, and angular corrections by utilizing MUA (Multi Unit Abutments)

“BIOLOGY...Respect it... and it will Respect you in return.”

BIOLOGICALLY-DRIVEN FULL ARCH THERAPY

“If you fail to plan...You better plan to fail”

step1: Starting with the End in mind

P L A N N I N G P H A S E

All projects, whether big or small, must start with a plan. One big advantage we have today, compared to 20 years ago, is accessibility to Digital Planning. Even with my 25 years of experience as an implant surgeon, I can never beat the accuracy of Digital Planning and the precision of Guided Surgery. For this full arch project, my digital platform of choice was the R2 system. Not only is R2 a robust implant-guide software, it is, more importantly, a practical fusion of digital-diagnostic and digital-planning interfaces. When integrated with a Large FOV Rayscan R2 STUDIO (20x20) CBCT, I am able to construct a predictable prosthetic outcome. (Figure.8)

Since the ZBR concept (zero bone reduction) does not involve any bone reduction, it was paramount that a tissue-borne guide was accurately designed for precise fitting. (Figure.7)



Figure. 7: Tissue-borne Surgical Guide R2GATE

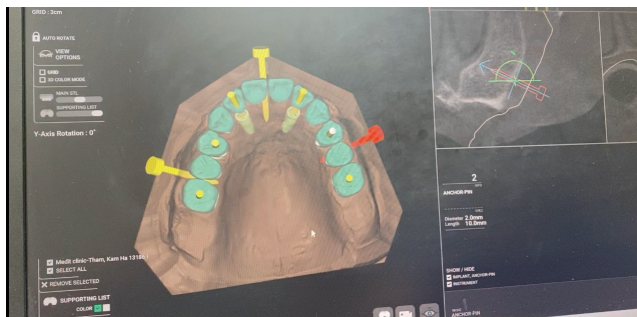


Figure 8: Pre-surgical planning using R2GATE software

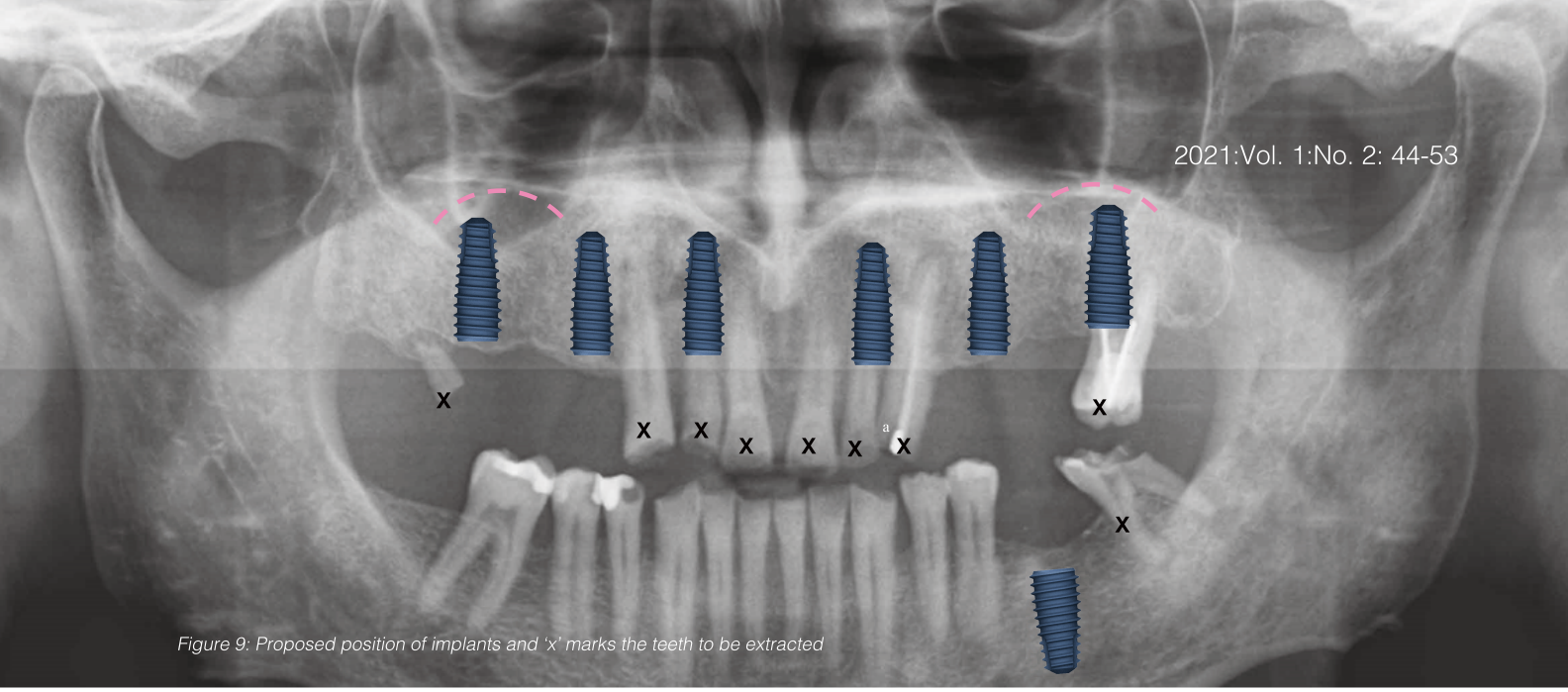


Figure 9: Proposed position of implants and 'x' marks the teeth to be extracted

‘no bone reduction...
no MUA... No Dentures...’

step 2: minimally invasive surgery

BIOLOGICALLY-DRIVEN SURGICAL PHASE

The goal was to perform a “Minimally Invasive Surgery.”

This involved the following:

1. Atraumatic extractions
2. Minimal flap design
3. No/minimal bone reduction
4. Use of PRF/Sticky Bone to rebuild any missing bone

The surgery was performed with local anesthetic under moderate sedation. All remaining upper teeth were extracted and the bottom left second molar was also removed. (Figure.9)

A total of seven implant fixtures (MegaGen, 11 degree conical connection) were placed; six fixtures on the top and one at the bottom left. Simultaneous minor sinus grafting was performed at the upper molar sites. (Figure.9) The preferred surgical approach was ‘Hybrid-Guided’. This means the initial osteotomy was performed using an R2 Guide and the R2 Surgical kit.

Thereafter, the remaining osteotomy and the delivery of fixtures were performed free-hand. This ensured optimal initial stability and ideal depth control.(Figure.10 and Figure.11)



Figure 10: Depth control of each implant is very important to achieve an ideal emergence profile for the subsequent abutment design



Figure 11: R2GUIDE is used to achieve precise osteotomy during the surgery



Figure 12: Very important to create ideal emergence profile including ample amount of embrasure space to maintain inter proximal papillae

‘no pink gums... no micro-gap... fixture level’

step 3: CAD/CAM FP1 provisional bridge

I M M E D I A T E P R O V I S I O N A L P H A S E

Once the surgery was complete, healing abutments were placed and the patient was dismissed. The patient returned home without any teeth for one night (Figure.10). Unlike the conventional 'All-on-X' concept where a traditional denture is “converted” into an immediate Fixed-bridge, the much thinner FP1 design deters an immediate pickup and denture conversion protocol. Instead, an accurate digital transfer of the fixture positions into EXOCAD was performed. Digitally, the positions of the implants were merged onto the original pre-surgical prosthetic design file (Figure.13). From there, a series of digital workflow steps followed. Over the course of a few hours, a CAD/CAM provisional bridge was milled out of a solid block of PMMA (Telio). (Figure.14)

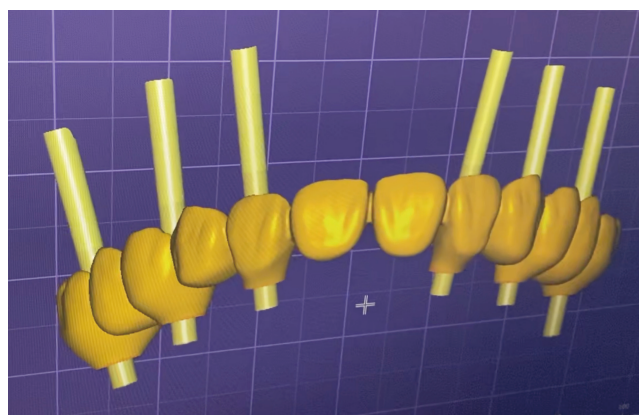


Figure 13: EXOCAD performing merger of pre-surgical FP1 prosthetic design to implant positions

“Form follows Function”

Proper design of the intaglio surface of the provisional bridge is of paramount importance. We must respect the surrounding biology. Each abutment emergence profile and the shape of each pontic must obey the fundamental principle of biological-width. (fig.12)

Failure to do so may result in unwanted papillary destruction and bone loss over time. The concept is simple. The full arch design of this particular FP1 bridge is typically a combination of two anterior implants, four posterior implants and four ovate pontics. (fig.12,13,14)



Figure 14: Provisional bridge is milled from a solid PMMA puck (Telio)

**“AND SURE ENOUGH,
EVEN WAITING WILL END...
IF YOU CAN JUST WAIT ENOUGH.”**
WILLIAM FAULKNER

Figure. 15

‘no pink gums... no micro-gap... fixture level’

step 4: Teeth-Next-Day bridge insert

PROVISIONAL INSERT AND 4 MONTH WAITING

Once the milling was complete, non-engaging fixture-level Ti-base abutments were bonded on to the PMMA bridge.(Figure. 16) The sprue bases were cut off and polished. Then the passive-fit of the bridge was checked. The patient returned a day after the surgery, ready to receive the provisional fixed bridge. The healing abutments were gently removed and the bridge was inserted (Figure.15,16). Local anesthesia was not necessary. Due to the minimally invasive nature of the surgery, post-op swelling and discomfort were minimal. Hardly any occlusal adjustment was needed. The patient was then instructed to continue on a soft diet and a 0.12% Chlorhexidine rinse for two weeks. After two weeks, at the post op appointment, the patient was instructed to resume a moderately soft diet with normal brushing and water-pik use.

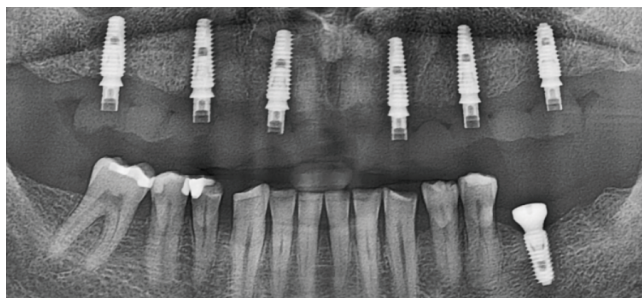


Figure.17: post-op x-ray after Provisional bridge insertion



Figure. 16: After the milling of PMMA bridge, non-engaging Titanium Link (Tibase) is glued on to ensure precise fit to the implant connections

“... We must respect the surrounding biology, thus, each abutment emergence profile and the shape of each pontic must obey the fundamental principle of the biological-width...”

"Respect biology... it will respect you in return"

Figure. 18: post-surgical 4months healing

step 5: Final Prosthesis - FP1 Segmented

6 - X - 4 - X / 2 - X - X - 2 / X - 4 - X - 6 (3 X 4 UNIT PFZ BRIDGES)

After 4-5 months of healing, we were ready to proceed toward the final prosthesis (Figure.18). The provisional bridge was removed, and ISQ readings were taken to verify adequate healing (Figure.20). A conventional PVS impression was taken and sent to the lab. For the final bridge, we milled custom titanium abutments and a PFZ (Porcelain Fused to Zirconia) substructure for bridge fabrications (Figure.19,21).

The SCRC (Screw-Cement-Retained-Custom crown) concept was utilized to ensure future retrievability of the prosthesis (Figure.19). The final prosthesis was segmented into three sections, each bridge section comprised of two abutments and two pontics. Each bridge was cemented onto the abutments using a resin bond cement (Rely-X).

The occlusion was adjusted and the patient was seen two weeks post-delivery for subsequent calibration. Once completed, the patient was scheduled for an annual hygiene/recall program.



Figure. 19: Final porcelain fused to zirconia segmented bridges



Figure. 20: ISQ reading is done to verify the healing of each implant



Figure. 21: Custom milled titanium abutments are placed and torqued to 30n.cm

Figure. 22: Final segmented bridge insertion. Note how each inter-proximal papillae has been maintained

Final Thoughts

“when you have a hammer... everything starts to look like a nail...”

~Abraham Maslow

BIOLOGICALLY-DRIVEN ZBR FULL ARCH THERPY

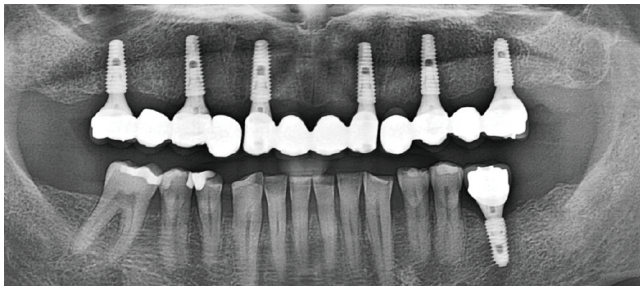


Figure. 23: Final panoramic x-ray to verify proper seating of all the abutments and bridges



Just like everyone else, it is easy for me to fall in to a ‘routine’ of daily endeavour. We tend to resort to a treatment modality that is easy and predictable. However, ultimately, I must choose the treatment option that is dictated by the Biology that is presented by the patient, and Not dictated by ‘what is easy for me to do.’ Comprehensive Full Arch Implant therapy, which was once thought to be extremely challenging is now simpler, easier, and more predictable due to the incredible advancement in CAD/CAM-Digital dentistry. These modalities are not only accessible but also have become very much affordable. The ZBR (Zero Bone Reduction) concept demands all of us to answer a very controversial question: “BONE REDUCTION... to Reduce? or Not to Reduce?” At the end of the day, we only have to ask ourselves ONE simple question, “What would I do... if it was my own mouth?”



FOUNDER OF BITES INSTITUTE: DEDICATED IMPLANT TRAINING CENTRE
info@BITESINSTITUTE.COM

Contact

Dr. Mark Kwon

Clinic name: Chrysalis Dental Centre

Address: 500-7300 Edmonds Street Burnaby B.C. V3N 0G8
Canada

Tel: +1 604 773 8452

E-mail: drkwon@bitesinstitute.com