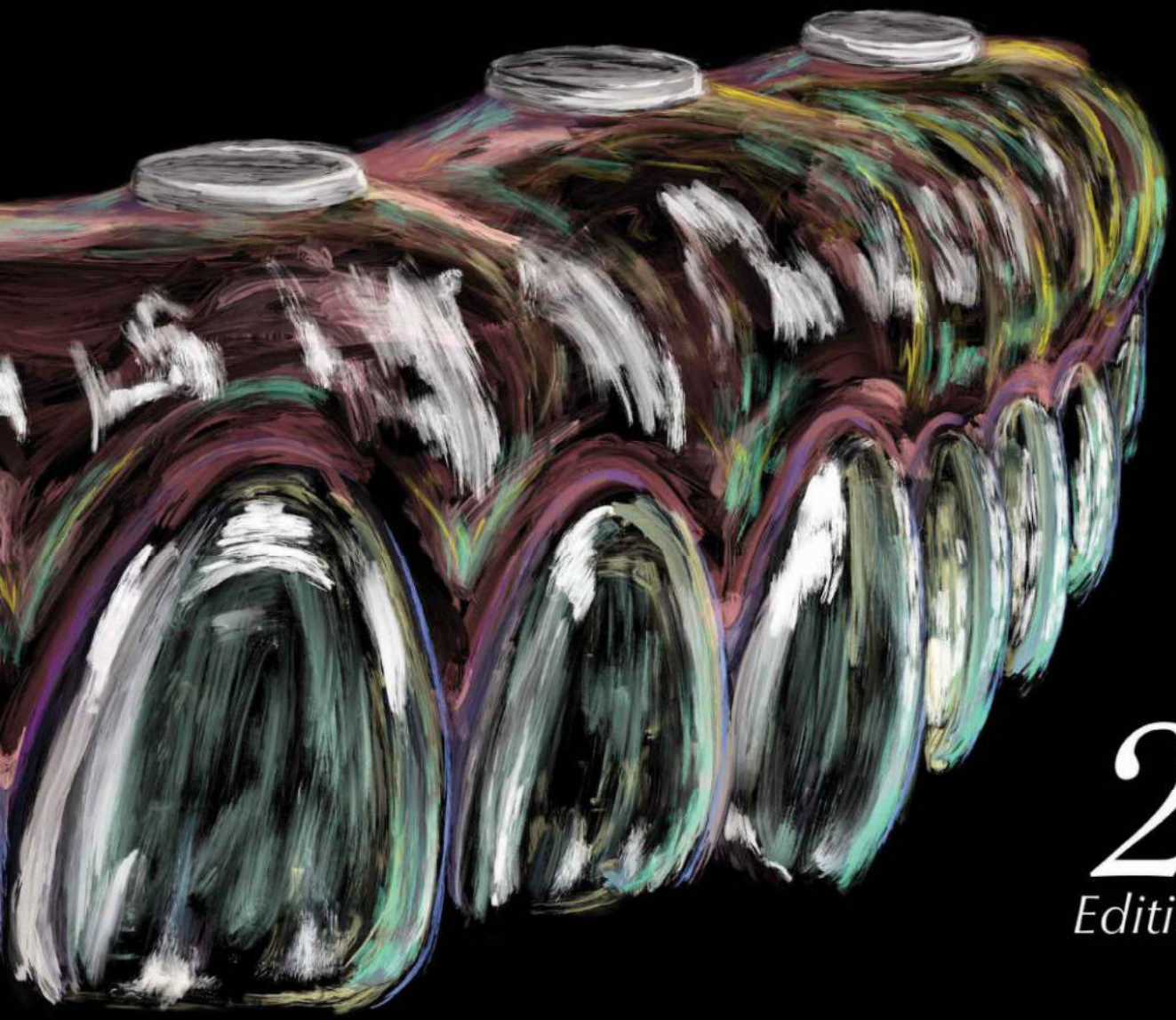
The Implant Ninja

ALL-ON-X

Handbook



2nd Edition

A no non-sense clinical guide by **Dr. Ivan Chicchon**

The Implant Ninja ALL-ON-X HANDBOOK

Second Edition

If you have been wanting to start doing big, full-arch implant cases in your office, but are unsure of where to begin - this guide was made for you.

Starting with basic mechanical principles and working our way up step-by-step, we cover every aspect of care from treatment planning to implant placement and prosthetic coverage. We also discuss how to avoid the pitfalls in this treatment with full-color photos of good, great, and terrible treatment outcomes.

This handbook will help give you the confidence and the knowledge base to begin taking on these big cases.

Dr. Ivan Chicchon is a Prosthodontist in Stockton, California. He maintains a small practice limited to dental implant rehabilitation where he invites colleagues to join him for training.

The All-on-X Handbook

The Implant Ninja
All-on-X Handbook

A No-Nonsense Clinical Guide to Full Arch Implants

Ivan Chicchon

Second Edition
March 2019

Second Edition 2019.

If you have questions/comments along the way, we'd love to hear from you! We are just chillin here spinning around in our chairs eagerly awaiting your message.

You can email us at implantninja@gmail.com

If you wanna ask me something directly, here's my direct email: Ivan@implantninja.com

Do me a favor, tell others what you think of this book!

1. GOOGLE: "Implant Ninja Education"
2. Click "Review"
3. Lemme have it…

This clinical handbook is dedicated to my daughter Olivia Grace Chicchon,
who has taught me what it means to be strong.

Contents

Acknowledgements

The following dentists have contributed photos, written content, and tips that are included in this handbook. This book would have been far less informative without their input. I've learned so much from them during this process and cannot overemphasize how valuable their insights have been.

- Carl Pogoncheff (my prostho mentor and friend)
- My coresidents at U Mich: Andy Dill & Jesse Kane
- Arshiya Sharafi (an OMFS friend in San Diego who teaches this stuff)
- Nate Farley (The go-to digital hybrids guy in my book)
- Naif Sinada (My insta-homie & super prostho innovator. @drsinada)
- Jeff Rodney (The hardest clinical instructor I've ever had)
- Micael Hilario (My perio friend from UOP)
- Peyman Raissi (IG homie. He posts a lot of live surgeries at @drpeyray)
- Alfonso Delgado (my neighbor, he's done more overdentures than anyone)
- Ramon Chicchon (my dad, always wondering why I'm not working more)
- Other social media friends: Miguel Casado, Yasin Aktas (his work is absolutely stunning @doc_aktas, Nader Salib (@surgical_gourmet)
- And a Special thank you to John Sybru who crafted the cover art along with some of the illustrations within the book. (@johnsybru.dds)

ABOUT ME AND THIS BOOK

As scary as it sounds, I worked on my first acrylic hybrid before I even knew how to make a denture. This is because in our dental school's curriculum, implant cases were optional, intimidating, and did not help you fulfill your graduation requirements.

The part that instilled the greatest fear of taking on implant cases was that you had to give a presentation in front of a panel of instructors including giants in full arch implant treatments such as Dr. Steven Sadowsky and Dr. Edmond Bedrossian (who have written much of the hallowed literature on full arch implant planning). It got brutal. You would see a confident, straight A student present a simple case and subsequently watch them deflate during an agonizing Q&A session. It reminded me of the part during each American Idol episode where Simon Cowell would make the contestants cry.

Needless to say, most students avoided implants like the plague.

I, on the other hand, saw implant cases as a challenge to be overcome. I didn't care that they were not a graduation requirement. Actually, much to the dismay of my clinical supervisor, I never really paid much attention to graduation requirements. I figured that even if I missed a SRP or an Endo test-case, I would eventually complete it and they would have to graduate me.

Also, I had made it a personal rule never to pass up an opportunity to become better at public speaking--so I actually really looked forward to going up against the dreaded panel.

So my classmates happily gave their implant cases to me, I became a 'regular' at the weekly implant presentations, and I began to gain a good foundation in dental implants.

In addition to the tough presentations, the clinical component of implants was very much a 'trial by fire.'

I remember one particularly grueling patient session during which I had to continue working *hours* past the clinic closing time. I was taking implant-level full-arch

impressions for a maxillary All-on-6 prosthesis and my tray got locked in. My instructor and I tugged for hours and tried like hell to check and recheck that all the impression coping screws were fully loosened. Finally, we decided to cut the tray and the impression popped loose.

Instructor: *"The next step is easy, just take occlusal records."*

Me: *"...Umm he doesn't have any teeth…"*

Instructor: *"Just make a wax rim."*

Me: *".....I haven't had denture block yet."*

I had to do my own research and teach myself a lot of the protocols. I stole my dad's copy of Carl Misch's massive textbook and obsessively searched Youtube for information. When I got stuck on a particular step or concept I would go and pick the brains of my local heroes, Doctors Anders Nattestad and Eduardo Gonzalez, who were always willing to sit down and teach me a thing or two.

I distinctly remember the frustration of trying to find a good resource to show me the step-by-step process for completing my full arch cases. But I never found one that explained it in an easy, no-BS manner. Alas, even Youtube failed me in this department. So, I made a note to myself that whenever I figured this stuff out, I was going to make a simple guide that explained it all.

I did eventually finish my dental school requirements on top of all my implant cases and was on track for graduation. (although I am pretty sure that I still owe an SRP test case)

Teresa (my fiancee at the time and high-school sweetheart) was looking forward to moving back to Stockton, getting married, and finally starting our life together. But I couldn't shake the feeling that I really wanted to master all this implant stuff. I called around to different prosthodontics residencies to inquire which residencies give you the best exposure to implant surgery.

That's where I stumbled across the University of Michigan. I submitted my application and got no response. So, I decided to pay a personal visit to this program and see if something good would come of it. I tried my best to impress them with examples of my dental school cases. On my third day there, they interviewed me, and 2 weeks later I was in!

Luckily, Teresa still married me (somewhat reluctantly? lol) and we packed up our Subaru outback and made the 3,000 mile drive across the country from California to Michigan.

During my residency, I chose to focus my training on fixed full arch implant prosthetics and did my best to do as little as possible of anything else. (I never cared much about requirements, remember?) To be honest, I doubted my resolve to complete my residency when I was forced to spend so many hours reading about pins and posts and denture theory. But I was able to supplement my learning by spending a lot of time in the OR with the maxillofacial surgery residents. (And it turns out denture theory is super important! Who knew?)

I was very lucky to have a lenient program director who allowed me to tailor my program this way. Looking back on it, I realize I must have really been a pain in his ass! After three years, to everyone's relief, I got my Prosthodontics certificate and relocated back home to California.

I can write an entire book about what happened next, but I'll leave that for another time. Suffice it to say that our daughter, Olivia, was born with a congenital abnormality called a Lymphatic Malformation on her neck and floor of mouth. Teresa and I have turned our lives upside down making sure we manage her healthcare properly.

But the funny thing is that Olivia turned out so strong and feisty that, if anyone needs to be taken care of it's me and Teresa because Olivia is a force to be reckoned with! Olivia is thriving in spite of her challenges. You can follow her story along on Instagram at @liviesstory.

For the last 3 years now, I've worked as a 'travelling implant guy' for many offices (including Western Dental) and now I also maintain a private practice limited to implants. But my favorite job is teaching others how to place dental implants and sharing my techniques and mistakes through my company, Implant Ninja.

The All-on-X treatment is one of the most transformative and rewarding services that I perform. I take the case from surgery to restorative. This handbook is an insight into my cases and my treatment philosophy. Of course, I'll share some of my best work, but more importantly I'll show you mistakes I've made along the way. They say that an expert is someone who has made all the mistakes to be made within a narrow field. Hopefully, by learning from my mistakes, you can become a little more "expert" in this treatment.

Importantly, I have included the work of many of my friends. The book is made 100x better by their efforts and their willingness to share their tips and tricks. I am very grateful for their contributions and I have learned so much from them.

Keep in mind that different clinicians have different way of doing things, so I invite you to read this with an open mind and to contact me with any feedback you might come up with.

I hope this book helps you. I have thoroughly enjoyed putting it together.

Cheers!
Ivan Chicchon

PS: I'm from Peru so my grandpa told me that no matter what, I have to let you know that the Incas (Peru's native people hundreds of years ago…) were the ones that invented implants. Yup, sorry P.I. but apparently these ancient warriors we're already immediate loading hybrids. But in all seriousness, they were doing some crazy things with implanting gold into jaws and skulls. SKULL implants! And to think I get stressed managing my patient complications!

The All-on-X Handbook

Chapter 1 | The Mechanics

Key Terms

- Beam
- Cantilever
- Cantilever Beam
- Simply Supported Beam
- Overhanging Beam
- Continuous Beam
- Lever
- AP Spread
- AOX (All on X)

Learning Objectives

- Understand how to best distribute implants for AllonX
- Be able to explain why the posterior implants are often tilted
- Be able to describe the beam mechanics involved in any AllonX case
- Discuss how a lever system is useful for discussing AllonX mechanics
- Discuss the AP spread in terms of beam mechanics

I want to thank John Brunski -Senior Research Engineer in the Division of Plastic and Reconstructive Surgery at Stanford - for his feedback while I was writing this chapter. He has published extensively on the mechanics of the All on 4 concept. I am honored that he took the time to help with this work.

Introduction

Full-arch implant rehabilitation involves an interesting combination of physics and physiology. Each implant placed serves as a foundation to the overlying structure. Depending on the position of the implants in the jaw, certain areas of the structure have more or less support than others.

The mechanical configuration of the implant-prosthesis construction dictates the stress applied to the bone around the implants, the tension applied to the prosthetic screws, and the overall strength of the prosthesis. Therefore, it is worth exploring some of the basic underlying principles that govern these forces. **This** is going to start off pretty basic, but bear with me.

In a previous edition, I proposed that lever systems best described the All-on-X mechanics. However, I think Beam Systems are a more appropriate comparison because they are rigid and non-movable. What do you think?

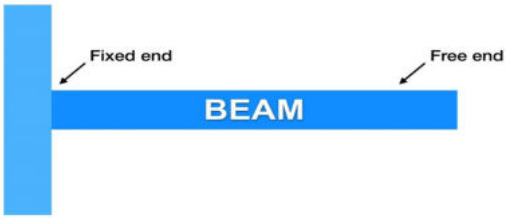
Beam Systems*

The best way to understand the mechanics of the All-on-X Treatment (I'll often refer to it as simply AOX) structure is to see it as a beam system. Beams are used in various construction projects and it is no different here, except for that in this particular construction the patient is constantly trying to break it down by munching on ribs, ice cubes, or even opening beer bottles with their teeth.

A **beam** is defined as a structural member which is used to bear different loads. It resists the vertical loads, shear forces, and bending moments. Let's look at the different types of beams.

There are **4 types of beams** that are relevant here:

1. The Cantilever Beam (Figure 1.1A)



2. The Simply Supported Beam (Figure 1.1B)

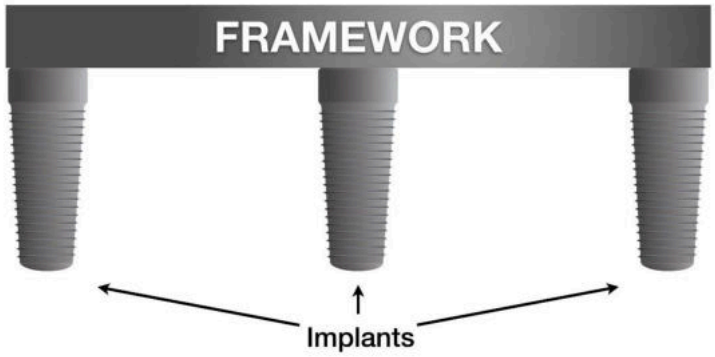
3. The Overhanging Beam (Figure 1.1C)

4. The Continuous Beam (Figure 1.1D)

Now, which one of these looks like our All-on-X prosthesis? There are some similarities in each one, right?

Ideally, we would like to ensure that each segment of the prosthesis is supported, right? So we would like for it to be structured similar to a **continuous beam** --with implants at each supporting site.

(Figure 1.2)



Just to clarify, I am not necessarily advocating for 3 implants here (although three implant protocols have been shown to be successful in the mandible). I am simply showing that each area of the framework is supported.

Although we would like for all parts of the framework to be supported, this is often not possible due to anatomical limitations such as the mental foramen and IA nerve in the mandible and the maxillary sinus in the maxilla.

Therefore, in order to give our patients a full set of teeth, we can choose to extend the framework distally past the last implant.

(Figure 1.3)

This leaves two areas of the framework without support. We commonly call these extensions **"cantilevers."** In an attempt to provide support to as much of the framework as possible and thereby shortening these cantilevers, it has become an accepted practice to tilt the distal implant with the platform of the implant in a more distal position and the apex of the implant in a more mesial position*,*.

(Figure 1.4)

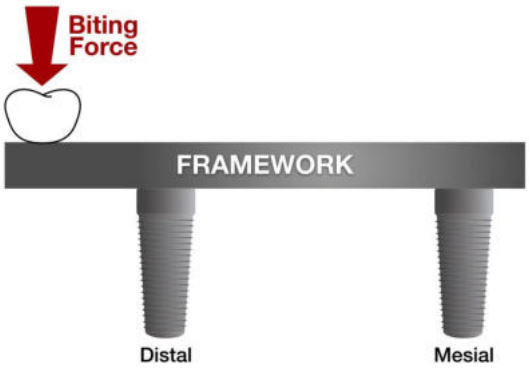
Nonetheless, to provide the adequate number and position of teeth, it is still often necessary to have an unsupported region of the framework in the posterior segment or sometimes even the anterior segment. Therefore, the beam system that best represents these scenarios is the **Overhanging Beam**. Notice that even though the framework can be said to have a "cantilever," the appropriate beam system to describe the scenario is not the Cantilever Beam but instead is the Overhanging Beam.

Let's take a look at how the mechanics of an overhanging beam impact the structure of the All-on-X prosthesis.

Beam Mechanics & Levers

This figure represents a side view of an All-on-X prosthesis. The distal implant is shown on the left and the anterior implant is shown on the right.

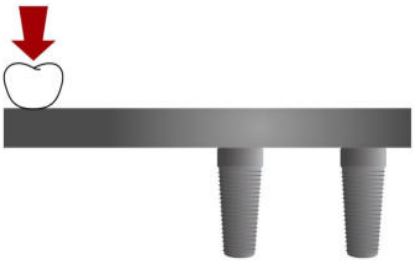
(Figure 1.5)



When a patient bites down on the distal cantilever, this applies forces on the anterior and posterior implants. Without attention to the design, these forces can become destructive and result in peri-implant bone loss, screw loosening, or even framework fracture. Therefore it is important to understand how the design affects these forces.

Compare the following two scenarios:

(Figure 1.6A)



(Figure 1.6B)

Which do you think will be more likely to cause complications?

Note that both have the same general layout. Both are Overhanging Beam systems. Both have two areas of support and both have biting forces applied at the unsupported portion of the framework.

If you said 'A' would cause more complications, you'd be right! But why?

It all comes down to lever systems. (You remember levers from dental school, right?)

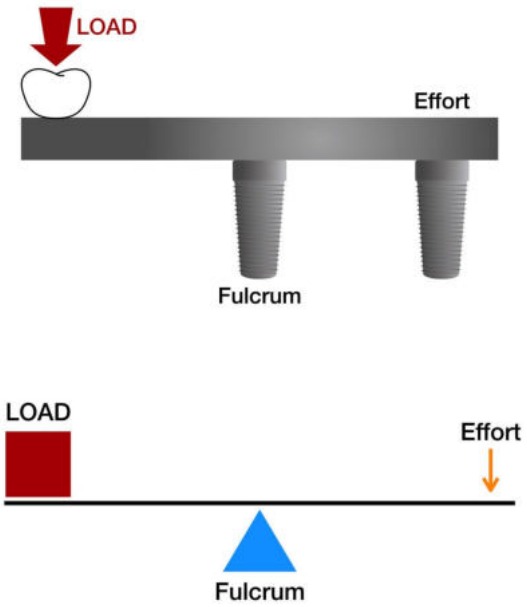
A **lever** is defined as a simple machine consisting of a beam or rigid rod pivoted at a fixed hinge, or fulcrum. A lever is able to rotate on a point on itself. While our prosthetics are not rotating, the same principles apply.

The key with levers is the position of the *fulcrum*, the *load*, and the *effort*. The fulcrum is the point around which the framework can rotate. The load is the biting force. The effort, is the force that resists the load on the other side of the fulcrum.

By moving these three points around, the **balance of the system is impacted significantly**.

Let's see where those points are in our example.

(Figure 1.7)

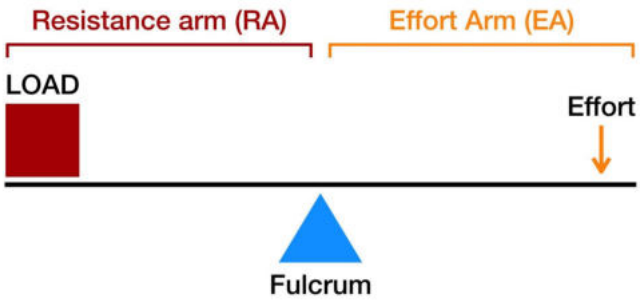


This simplified model shows how this is similar to a seesaw.

The difference is that in our All-on-X scenario, the fulcrum and the effort are immobilized. Therefore when a biting force is applied, the posterior implant (fulcrum) absorbs compressive forces. The prosthesis simultaneously pulls up on the anterior implant (effort), applying tension at the anterior implant site. Actually it is the screw of the anterior abutment that provides the effort. The screw must resist the load on the opposite side of the "fulcrum" or else it may break or loosen.

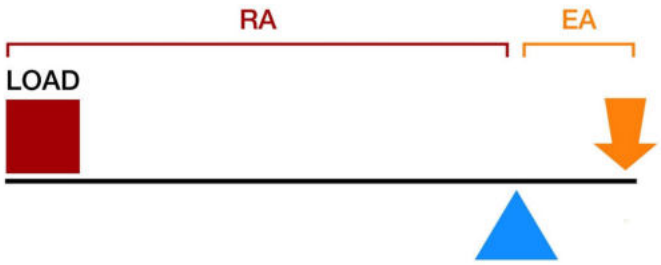
Lets use our seesaw model to compare scenario A & B from Figure 6. There are two 'arms' in this seesaw example. The resistance arm is the distance from the load to the fulcrum. The effort arm is the distance from the effort to the fulcrum.

(Figure 1.8)



If you have a long resistance arm, and a short effort arm, you have to put a lot of effort to balance the seesaw.

(Figure 1.9)



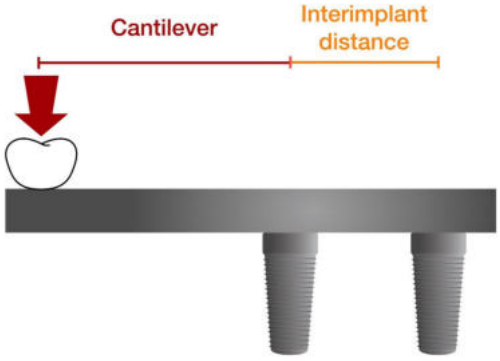
If you have a long effort arm and a short resistance arm, it will be much easier and require less effort to balance the seesaw.

(Figure 1.10)

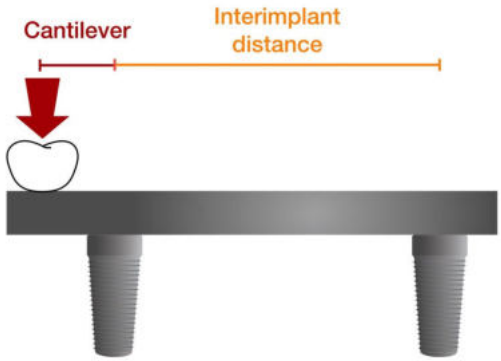
Now let's use this principle to compare A&B. In this example, I want to swap out some terminology. Instead of resistance arm, let's say **cantilever,** and instead of effort arm, let's say **inter-implant distance.**

This will make the example a little more intuitive.

(Figure 1.11A)



(Figure 1.11B)



In scenario A, the cantilever is very long and the inter-implant distance is very short. Because of that long cantilever arm, any occlusal force applied at that tooth will be multiplied and can cause damage to the system. The cantilever arm multiplied by the occlusal force is called the **bending moment**. If enough occlusal force is exerted, the system will fail at the weakest link.

If the weakest link is the framework, the cantilever arm will break off.

If the weakest link is the posterior implant, the implant may experience bone loss or failure.

If the weakest link is the anterior implant, the implant may experience bone loss or failure.

If the weakest link is the prosthetic screw, it may loosen or break.

In scenario B, the cantilever arm is very short compared to the inter-implant distance. Therefore, the resistance to the occlusal force is enhanced and the likelihood of any of those complications listed above is minimized.

The AP Spread

So how long can you make your cantilever without causing all of the destruction I just listed? The literature talks about it in terms of something called the AP Spread.

The AP spread, or Anterior - Posterior Spread, is just a fancy term for the inter-implant distance we have been talking about.

In the literature, the AP spread is defined as **the distance measurement between a line measured from the center of the anterior-most implant(s) and a line measured from the distal of the distal-most implants.**[2,3]

A greater A-P spread allows for a longer distal cantilever past the distal implant in the definitive prosthesis. An unfavorable A-P spread, on the other hand, will force you to limit the distal extension of the prosthesis. Often, a shortened dental arch concept (restoring with only 1 premolar and 1 molar on each side) is necessary when the A-P spread is too narrow.

Although the specific numbers vary, a generally agreed upon value states that the cantilever distance can be **1.5 times the interfixture distance**, as determined by English et al. The number proposed by the older Branemark protocol was 2.5 times the A-P spread,[4] with all other stress factors being low. Branemark protocols typically were opposing complete dentures, so the stress factors were low for these case reports.

An article by Lyndon Cooper proposes that 10mm can be used as a rule of thumb for distal cantilever length on an All-on-X prosthesis.[5] This typically corresponds to a single tooth, like a single molar cantilever.

Basically, the longer the cantilever is relative with the A-P spread,

- The greater the compression at the distal implant.[5]
- The greater the force exerted at the anterior implant site - leading to screw loosening.[6]
- The greater the bending moment at the distal cantilever which can cause fracture of the prosthesis. (Failure occurs at the weakest link. The weakest link might be the implant site, the prosthetic screw, or the restorative materials.)[7]

References:

1. ACOP. *The Glossary of Prosthodontic Terms (8th Edition)*. J Prosthet Dent; 2005. doi:10.1016/j.prosdent.2005.03.013.

2. English CE. Critical A-P spread. *Implant Soc*. 1990;1(1):2-3.

3. Rodriguez AM, Aquilino SA, Lund PS. Cantilever and implant biomechanics: a review of the literature. Part 1. *Journal of Prosthodontics*. 1994;3(1):41-46. doi:10.1111/j.1532-849X.1994.tb00124.x.

4. Adell R. Tissue integrated prostheses in clinical dentistry. *Int Dent J*. 1985;35(4):259-265.

5. Cooper LF, Limmer BM, Gates WD. "Rules of 10--"guidelines for successful planning and treatment of mandibular edentulism using dental implants. *Compendium of continuing education in dentistry (Jamesburg, NJ : 1995)*. 2012;33(5):328–34–quiz335–6.

6. Tiziano Tealdo DDS MD, DDS MM, et al. The influence of cantilever length and implant inclination on stress distribution in maxillary implant- supported fixed dentures. *The Journal of Prosthetic Dentistry*. 2011;105(1):5-13. doi:10.1016/S0022-3913(10)60182-5.

7. Rodriguez AM, Aquilino SA, Lund PS. Cantilever and implant biomechanics: a review of the literature, Part 2. *Journal of Prosthodontics*. 1994;3(2):114-118. doi:10.1111/j.1532-849X.1994.tb00124.x.

8. Aparicio C, Perales P, Rangert B. Tilted Implants as an Alternative to Maxillary Sinus Grafting: A Clinical, Radiologic, and Periotest Study. Clin Impl Dent Rel Res. 2001; 3: 39-49.

9.Malo P, Rangert B, Nobre M. All-on-4 Immediate-Function Concept with Branemark System Implants for Completely Edentulous Maxillae: A 1-Year Retrospective Clinical Study. Clin Impl Dent Rel Res. 2005; 5(S1): S88-94.

Chapter 2

Categories for Prosthetic Materials

Key Terms

- Durable Acrylic Prosthesis
- Acrylic Hybrid
- Monolithic Zirconia
- Component Hybrid

Learning Objectives

- Be able to compare all of the different restorative materials and describe their benefits and weaknesses.

Categories for Prosthetic Materials

There are so many different terms being thrown around for the prosthetic portion of the All-on-X treatment. The term "hybrid" is often used as a catch-all term for All on-X-prosthetic. But for the purposes of staying sane while reading this handbook, let's get on the same page about what to call the different types of prosthetics. Here are the different categories of materials that I use:

Durable Acrylic Prosthesis

This is basically a long term temporary prosthesis that is made without any milled or casted bar. It consists of titanium cylinders on each abutment, some metal reinforcement connecting the titanium cylinders, with acrylic processed around the metal. I use this prosthesis for some patients who cannot afford the more conventional restorative options. I am continually surprised with how well these types of prosthetics hold up on many of my patients. Of course, they might not be the best option for bruxers, but this prosthesis is a good design to keep in your toolbelt.

As a side note, there are a couple of companies that make prefabricated bars that you can customize to reinforce a durable acrylic prosthesis. I haven't used them, but I wanted to show you what they look like. The one on the left is available from www.dibay.co and the one on the right is called the Easy Bar from Fast ProTec.

(Figure 2.1)

(Figure 2.2)

I charge about $15,000 for the surgery + prosthesis for a durable acrylic prosthesis. Lab pricing can range from $750-1,200. (Of course lab prices vary depending not only on which lab you use but what level of involvement you have with the lab procedures)

Acrylic Hybrid

This is the tried-and-true design that the longest track record of success. It consists of a milled titanium framework rigidly connecting all of the implants and there is acrylic that is processed around that titanium frame. There are many different designs for the titanium framework but the important thing is that it provides adequate strength, adequate retentive features for the acrylic to bind to, and it must be slim enough to allow for sufficient acrylic thickness around it.

I charge around $23,000 for surgery + prosthesis in my office. Lab pricing can range from $2,300 - 5,000

Below is an example of a titanium bar that connects all of the implants together (Figure 2.1) One of the cons of selecting the acrylic options for restoration is that fractures or teeth popping off is a common complication. The retention grooves on the bar helps to reduce incidence of acrylic fracture.

(Figure 2.3)

(Figure 2.4) **Illustration of a cross section of the prosthesis.**