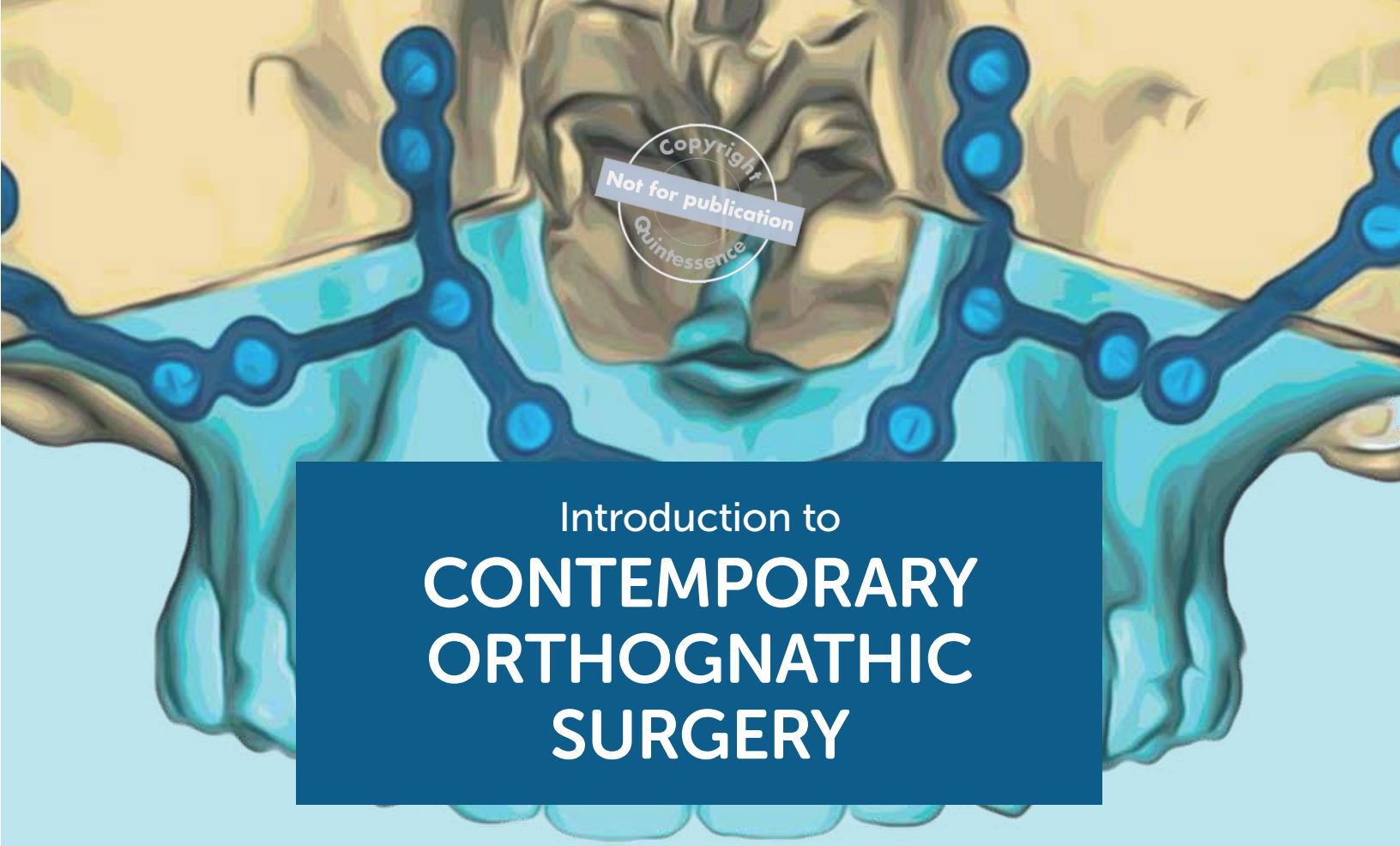

Introduction to CONTEMPORARY ORTHOGNATHIC SURGERY

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PREFACE

We wrote this book for residents. We want this collection of information to give you a foundational knowledge of orthognathic surgery and be easy to read and understand. We want it to be the kind of book you can pick up and review the evening before you go to the OR to review a procedure or before you go do an evaluation. Some of the best learning takes place when residents and staff discuss surgeries and cases to fill in knowledge gaps and describe the moves and feel of surgery. This book is the distilled essence of those conversations. It is not a dense text filled with historical information and references, because we wanted it to have a more organic feel. The photos and diagrams will build your knowledge of the surgical steps while also explaining ***why*** things are done in specific ways and highlighting the critical things to think about along the way.

Orthognathic surgery is beautiful. You can truly change someone's life in a brief procedure. This book will help you learn the basics, refresh your memory of the steps, and possibly make you question and think about the reasoning involved in each step. Anyone can learn a cookbook sequence of steps, and it is okay to follow a basic formula as you learn, but as you grow, you should question each maneuver and its purpose. Enjoy the journey.

—Andrew, Joe, and Jon

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DEDICATIONS

To my surgery mentors who dedicated their careers to teaching and instructing, many of whom are contributors to this book. To Michelle Hood, Jason Untrauer, and the teachers and mentors I had along my journey who inspired the curiosity, fire, and passion for science and learning. To my parents, Thea and Jurg, for always inspiring and supporting me, and to my brother Max for being my best friend. And to my loving wife, Ariana, thank you for your patience and support.

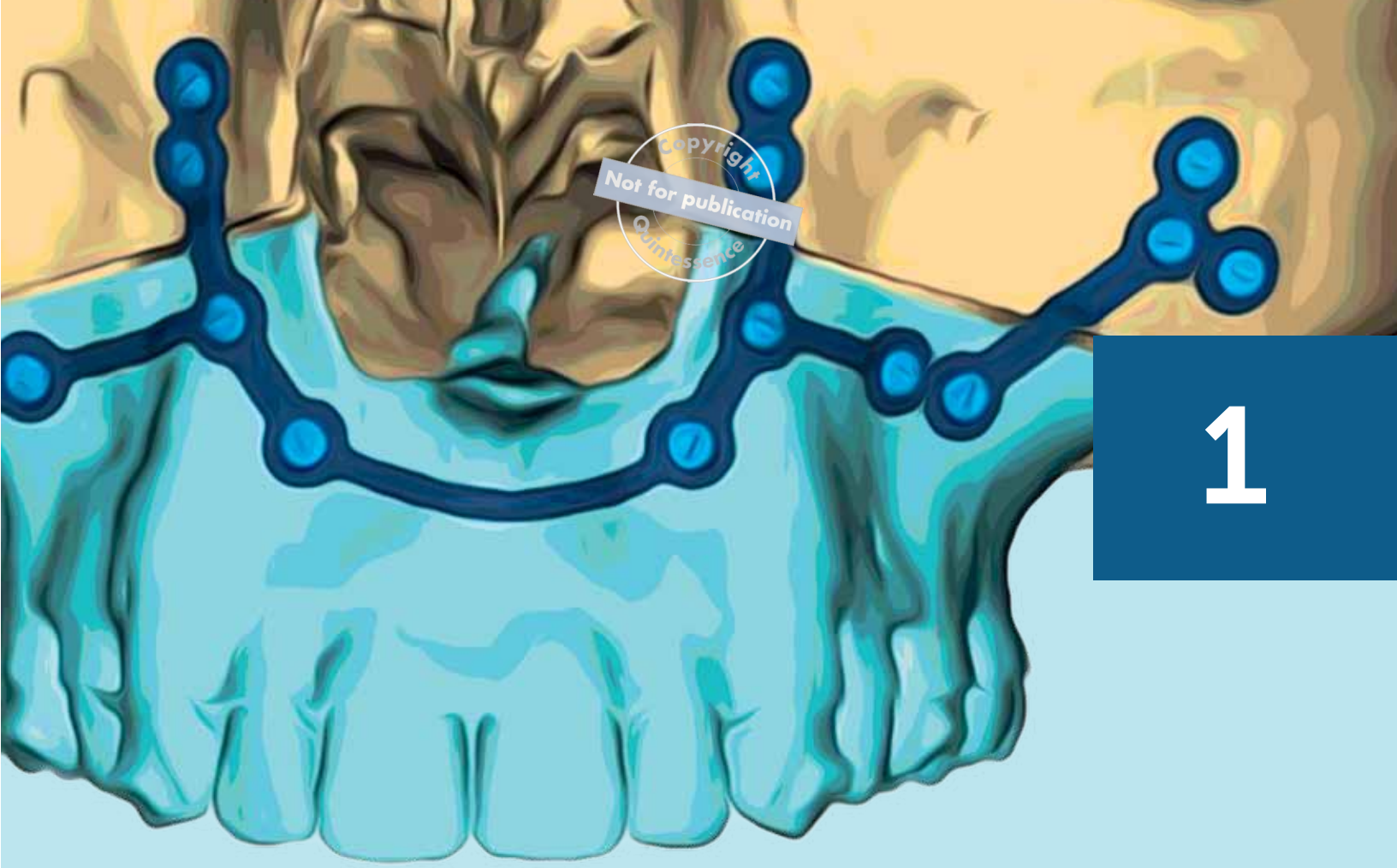
Andrew C. Jenzer

To my colleagues and residents who I have worked with over the past decade. To my patients who have honored me by trusting me with their care. For my wife and children who saw me through residency, fellowship, three tours in Afghanistan, and hours spent in the hospital. Knowing you were always there, ready to receive me when I came home, is the fire that drove me to succeed. And most of all to my Lord and Savior Jesus Christ, who saved me from my sins, gave me new life, and brought me safely through every danger. His steadfast love endures forever.

Joseph W. Ivory

To those who have dedicated themselves selflessly to the profession of oral and maxillofacial surgery and to those who are striving to join those ranks. To my wife, Rachel, and my parents, Les and Debra, for their steadfast love and support.

Jonathan L. Czerepak



1

THE EVALUATION APPOINTMENT

Andrew C. Jenzer

The goal of this chapter is to clearly explain how to do an orthognathic workup with the patient in your chair, covering the subjective and objective sections, measurements, photographs, models, and bite registration. There are many ways to accomplish this; I will present you with how I do things. Like surgery, there are many ways to do something, and you should always strive to stay away from a cookbook mentality, but when you are learning for the first time, a template can be helpful (see the final section of this chapter for a customizable orthognathic evaluation template). Then, as you develop, you can alter how you do things to fit your style. I always tell my residents that the most important thing is to think critically about why you are doing something and understand the reasons behind it. I will strive to do that in this text to allow you a window into my thought process and explain how I structure my workups.

The goals of a good workup are *(1)* to gather the information that will allow you to make a correct diagnosis, which leads to an excellent surgical plan; *(2)* to

spend time with the patient explaining the procedures, risks, and complications associated with them and go over the timeline and process of surgery; and *(3)* to build rapport and trust with your patient to help them feel as comfortable as possible. A poor workup will lead to a flawed surgical plan. I always strive for predictability in surgery; the more predictable you can make your surgeries, the more you minimize all the factors that could contribute to a bad outcome or complication. **Never forget: Predictability equates to efficiency.**

There are two main types of workup: an initial workup and a final workup. An initial workup is when you see a patient who is not yet in orthodontics or has at least 6 to 12 months of orthodontic treatment left before surgery. A final workup is when a patient is referred from an orthodontist ready for surgery. Though most patients generally fall into the latter category (depending on your practice or residency), the initial workup is a critical skill because it emphasizes communication with the orthodontist and the orthodontic setup of the case. You must be able to understand and be a part of the treatment planning from the beginning, as many of the decisions about extractions, how to set up the teeth, etc, play a significant role in what surgery you will do. (Chapter 3 focuses on this aspect of treatment planning and communication—that is, how to speak orthodontics.) There are several differences between an initial and final workup. For example, the surgical plan is generally set in a final workup, and extra impressions are required to facilitate the virtual surgical plan (if an occlusal scanning technique is not used). The photographs and evaluation process, however, are the same for both.

Workup and Examination

I always start by meeting the patient and asking what brings them to my office. The response could be "I want jaw surgery" or "my bite has always been off, and I want it fixed" or something to that effect. This naturally leads to a discussion of the history of present illness. You want to explore how long the problem has been present and any inciting events, like trauma. The main reason I dig into this is to see if something else might be going on besides a hypoplastic or hyperplastic jaw, namely something with the temporomandibular joint (TMJ). For example, I have seen plenty of patients who suffered an injury in childhood leading to a hypoplastic condyle and then insufficient development on one side, leading to both jaws being severely canted. Conversely, a hyperplastic and growing condyle can also manifest with facial asymmetry. Other considerations should include any syndromes and hemifacial microsomia, which can lead to numerous problems depending on the etiology and severity.[1–3]

I always ask them if they have had previous orthodontic therapy. Often patients who undergo multiple rounds of orthodontics end up with moderate to severe root resorption, so elucidating and documenting that in the history, and commenting

on it in your notes, is imperative. **Remember: Good documentation is your best friend; a preexisting problem becomes your fault if you do not document it.**

I then do a complete medical history review, covering past medical and surgical history, medications, allergies, and family and social history. Of particular importance is any history or problems with the TMJ and cervical spine. This then transitions into our limited physical examination. Any pertinent positives get a closer look, but otherwise the examination is generally limited to the head and neck.

I perform a full head and neck examination, which I will not detail here, but I will emphasize certain elements that are pertinent to orthognathic surgery. A portion of the workup and diagnosis will occur later using the photographs and radiographs you will obtain, but certain things need to be examined and measured clinically. A thorough TMJ examination is necessary, and any problems should be considered and addressed. This is a very detailed and controversial subtopic that is beyond the scope of this introductory text, but combination joint replacement with orthognathic surgery is discussed in chapter 10. I do a careful intraoral examination where I look at the hard and soft tissues, noting things like missing teeth, hygiene, and classification and characterization of the malocclusion using the Angle system (Class I, II, or III).[4,5] More detailed analysis regarding crowding, overbite and overjet, and shapes of the arches is postponed until later when I have photographs and models. Note that for any final workups before I bring a patient into the operating room, I perform all other necessary examinations and documentation needed, including a review of systems, an examination of other systems, and assigning an ASA classification to the patient.

Tooth show in repose

A few things are critical to measure clinically with the patient in the chair. The first is tooth show in repose (TSIR). TSIR will drive your surgical plan later because it will dictate the final position of the maxilla. It is the main driver behind figuring out the ideal positions of the jaws. TSIR is the relationship of the maxillary teeth to the upper lip in a relaxed position, or more simply, how much tooth structure shows at rest. I have found that the easiest way to get the patient into this relaxed position is to have them maintain their head in an upright and neutral position and simply ask them to open halfway while breathing through their mouth and keeping their face relaxed. The lips will naturally fall into the natural relaxed position, and then I use a Boley gauge to measure how much central incisor display is present. **I triple-check this measurement because it is absolutely critical in the planning process.** As surgeons, we use TSIR as a reference point instead of tooth show in animation because it is a much more predictable variable. Tooth show in animation can be affected by many other factors like the gingiva, amount of animation, etc, and can be addressed after surgery with tools like gingivectomy, botulinum toxin, or reverse vestibuloplasty.

Depending on age, a young to middle-aged person will show 1 to 4 mm of TSIR.[6] As we age and our tissues get more lax, we have less TSIR because the upper lip thins and hangs down more, obscuring more of the dentition. A common mistake among residents is estimating this measurement based on patient photographs. Do NOT do this; it is such a critical measurement because it dictates the final position of the maxilla, and you should not leave this up to a guess.

Midlines

The other thing that I always measure is where the midlines of the maxilla and mandible are related to the midsagittal plane and to each other. An effective way to do this is to have an assistant hold a piece of dental floss vertically in the middle of the patient's face while you measure how far off the midlines are on either side. Remember to think about the nose; if it is off to one side, it can change your findings if you ignore it, so try to use a midline down the center of the face. It can be helpful to measure the upper lip length both at rest and in animation.

Canting

Another thing to mention here is measuring a cant. A cant is a sideways tipping of a jaw, usually with reference to the maxilla, though the mandible will often cant to compensate. A good rule is that a cant of 2 mm or less is not evident to the untrained eye. With virtual surgical planning (VSP), measuring and correcting cants has become much easier and more predictable than model surgery. If a patient has a pronounced cant over 2 mm, I generally measure it clinically. To do this, I measure from the top of each orthodontic bracket (or cusp tips if no brackets are present) for the maxillary anterior teeth to the medial canthus of each eye. For the maxillary right canine, lateral incisor, and central incisor, I measure to the right medial canthus. For the maxillary left central incisor, lateral incisor, and canine, I measure to the left medial canthus. This is not a consistent measurement because you are estimating the position of each medial canthus and trying to duplicate that on the other eye, which introduces error. Also, any component of vertical dystopia (ie, one eye being higher or lower than the other) can make this measurement unreliable. Generally, this becomes more important in patients with either hemifacial microsomia or a hyperplastic or hypoplastic condyle, leading to a marked facial asymmetry. These patients tend to present with cants of 5 mm or more.[2]

Photographs

The next step is to take photographs. I will discuss some basics of photography here, but I encourage you to learn more about the basics of dental-related photography, because taking good photographs for workups and during surgery is

a necessary skill.[7] Generally, I use automatic settings for extraoral photographs and a custom manual setting for intraoral images.

Using your camera's portrait mode or automatic setting for extraoral photographs is sufficient. The f-stop is a crucial feature to understand; it determines the depth of the field of focus in a photograph and generally goes from low (around 3 to 5) to high (24 to 30). A low f-stop is fine in extraoral photographs and will allow good image capture. For intraoral photographs, you want to turn the f-stop up as high as possible, which is why I use a manual setting. If you are taking an intraoral center photograph of the patient in centric occlusion, for example, increasing the f-stop will allow all of the teeth to be in focus when you focus the camera on the canine and take the shot. If you have a low f-stop for this photograph, the anterior teeth and molars will blur and be out of focus.

For intraoral photos, I use a standard lens with a ring flash and my manual settings configured to a high f-stop and a low ISO. ISO is the camera setting that dictates how long the aperture is open and capturing light. A standard ISO is often set to 800, whereas a high ISO can be 3,200 or more. Here, I like an ISO of 200. This will provide you with a crisper photo with less noise and granularity, but it does require a good light source, like a ring flash. Changing other variables can have different effects, but that discussion is beyond the scope of this chapter.

Extraoral photographs

For extraoral photographs, you want an environment where you can consistently obtain high-quality images. I use a room with a dark photo backdrop and a tall standing ring light. If you do not have this available, using blue towels to create a backdrop can work. I take two or three photos in each position, which allows for mistakes and optimization during editing. A discussion on how to take each specific photograph follows here, with an analytical description later. Note that all of the photographs in this chapter are of me, so I reserve the right to make fun of the patient as we go through this process.

There are three critical extraoral photographs and a few optional ones. The first is the frontal repose photograph (Fig 1-1), which allows evaluation of the face at rest and a demonstration of the TSIR. You want to approach this the same way you evaluate the TSIR in the chair. I simply ask the patient to breathe through their mouth and open their mouth a little until I can see the maxillary teeth, and then I ask them to open or close it slightly to get it where I want it. You want to achieve a relaxed soft tissue drape to find the proper relationship of the upper lip to the maxillary teeth. The camera should be at a height that puts it level with the patient's face.

The second critical photograph is the frontal animation (smiling) photograph (Fig 1-2). You want to achieve a realistic animation, so I usually make a terrible joke here to get the patient to smile. This photograph allows for evaluation of the

FIG 1-1 *(left)*
Frontal repose. Note the slightly open mouth and maxillary incisor display. Here I am showing minimal TSIR, about 1 to 2 mm.

FIG 1-2 *(right)*
Frontal animation. Find your favorite bad joke to put the patient at ease and capture a real smile.

FIG 1-3 *(left)*
Lateral profile with Frankfort horizontal (FH) plane marked. The FH plane (inferior of the orbit and superior aspect of the ear canal) should be parallel with the floor.

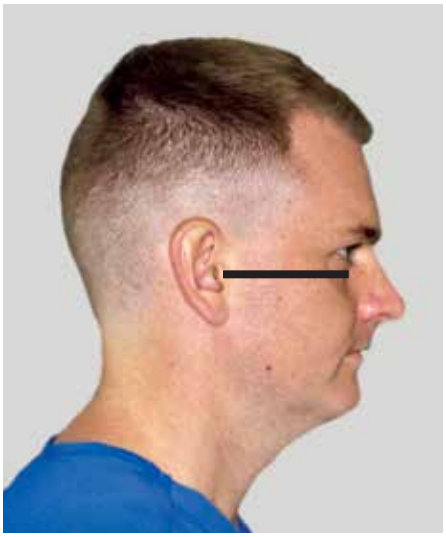


FIG 1-4 *(right)*
Patients generally lift their chins, exaggerated here, so positioning the FH parallel to the floor is critical.

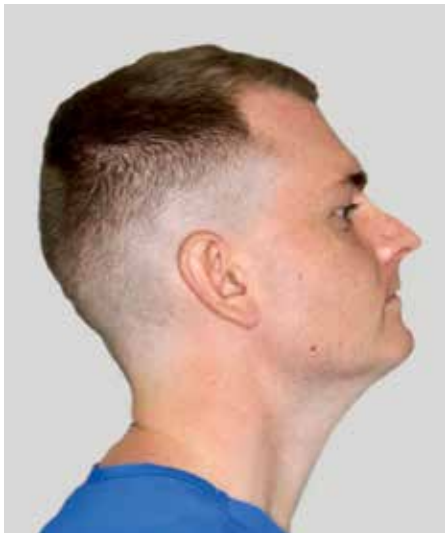


FIG 1-5 *(left)*
Example of a right three-quarter view. Try to line up the tip of the nose with the contralateral malar area. The photograph is repeated on the left side as well.

FIG 1-6 *(right)*
Fox plane photograph to look for any canting. The Fox plane is placed against the maxillary teeth and held in place by the patient using their thumbs. Adjust the patient's head up or down so the photograph is directly in line with the metal edge of the plane. Minimal to no canting is seen here with my maxilla. You can also instruct the patient to smile so you can evaluate the teeth and contact with the Fox plane, especially in a multiplanar occlusion.

tissues of the face and balance of structures in animation as well as assessment of the dentition in animation (ie, the buccal corridors, gingival display, etc).

The last photograph you must capture is the lateral profile shot (Fig 1–3). This photograph can be tricky to obtain because nearly all patients lift their chin up when asked to pose for this shot (Fig 1–4). People intrinsically understand that by doing this, they make their necks look better and hide any retrognathia or adipose tissue, and in the setting of the photoshoot, it is a natural reaction. You want the Frankfort horizontal plane, which is from porion (the superior point on the bony external auditory meatus) to orbitale (the inferiormost part of the bony orbit) parallel to the floor, which you can see marked on Fig 1–3 for reference. You also must ensure they are biting in centric occlusion and not posturing their mandible forward. If they are retrognathic, they will often stick their mandible forward to hide this. I tell the patient to bite on their back teeth and hold that bite while I take this photograph. This allows an accurate evaluation of the face from the lateral view and helps determine the relationship between the maxilla and mandible.

The optional photographs here are the three-quarter views and the Fox plane photograph. Three-quarter photographs (Fig 1–5) are not ones I typically take during orthognathic workups, but they are standard as part of my cosmetic workup and really highlight the malar areas. The key to these photographs is lining up the tip of the nose with the soft tissue of the cheek behind it. The Fox plane photograph is taken to help determine whether there is any canting of the maxillary plane (Fig 1–6). The sterilized piece of metal (the Fox plane) is taken out of the package, and the patient is instructed to use their thumbs to press it gently against their maxillary teeth while making fists with their hands. You must ensure that the patient understands that they need to keep it flat against the teeth; if they rock it, the photograph will be invalid. The patient is then manipulated until the Fox plane edge is flat toward the photographer; you want to see light reflecting off the metal edge in the photograph. With VSP being widely used, the measurement, assessment, and correction of any cant is much easier, making this a somewhat outdated photograph. However, consider it during your evaluation process in cases with severe cants.

Intraoral photographs

Once the extraoral photographs are taken, I bring the patient back to the evaluation room and take the intraoral photographs. I have learned and tried many methods for this, and the following is what I have found works best for me. I use a pair of metal cheek retractors and a dental mirror as well as a ring flash on my camera and as high an f-stop as possible, as discussed earlier. Have your assistant place the mirror in a bowl of warm to hot water as you start this process; it makes the mirror less likely to fog and gives better photographs.

The first photograph is the intraoral center view. I have the patient sit in the dental chair and recline it until it is parallel with the floor, all the way back. I

FIG 1-7 *(left)*
Intraoral center photograph. Note that the anterior and posterior teeth are in focus.

FIG 1-8 *(right)*
Intraoral left view. The camera is focused on the premolar areas. Ideally, the retractor is pulled back to allow visualization of the second molars without changing the angle of the camera, but in small mouths (like mine) this can be difficult.

give them the metal cheek retractors, generally making a joke about Wolverine (of the comic book *X-Men*) claws, and instruct them to place the bigger ends inside their cheeks. I then stand over the patient and take the photographs directly down and into their mouth. Getting an excellent intraoral photograph is tricky, mainly because it is hard to keep the entire field of view in focus. Often junior resident photographs will have some teeth in focus with others blurry and out of focus. The trick to this is to use autofocus on the canines, then move the center of the shot back to the middle and take the photograph (Fig 1-7). This will position the middle of the field of focus at the anteroposterior position of canines and extend your depth of field forward to capture the anterior teeth and posteriorly to capture the molars.

I then sit on my office chair, keeping the patient in the same reclined position, and move on to the intraoral left and right photographs (Fig 1-8). For the right intraoral photograph, I have the patient hold the left retractor very loosely, near the midline, simply to keep the soft tissues off the anterior teeth. I then take control of the right-sided retractor and tell them that I will briefly pull hard to get the photo and remind them to keep biting down. Getting this photograph is a balance because ideally you are coming directly perpendicular to the teeth on that side. But often the soft tissue is in the way, even with aggressive pulling. So you want to focus this shot on the premolar segment and cheat forward slightly so that your camera lens looks backward into the mouth a little. In an excellent intraoral left or right photograph, you can see the anterior part of the second molar. (We all know that providers make awful patients, and despite many attempts by my coauthor Dr Czerepak, my small lips were unable to pull back far enough to demonstrate this well in these photos, but hopefully you get the idea.) Another trick is to change out the metal cheek retractor you are using to pull the patient's lip back for a curved plastic one; I can more predictably and more easily get the shot I need using this.

Another technique to consider is using mirrors to obtain these shots (Fig 1-9). You can sometimes get a good photograph by placing a unique mirror into the side of the mouth and levering it out. This is an acceptable technique; I simply

FIG 1-9 *(left)* Alternative technique of using a mirror to take the intraoral left photograph.

FIG 1-10 *(right)* Maxillary arch photograph. The key is good mirror positioning, effective use of the retractor, and prevention of fogging.

don't routinely use it as I have found my methods give me quick and predictable photographs, and I find mirror photographs somewhat fickle due to fogging.

The last two intraoral photographs are the maxillary and mandibular arch shots. Still keeping the patient reclined all the way back, I explain to them what's going to happen—that I will place a big mirror in their mouth that fogs easily and ask them to hold their breath for 5 seconds when it goes in. I then get the maxillary shot first (Fig 1-10). I have the patient use the metal cheek retractors to hold their upper lip out of the way, have them open as wide as possible, and then have my assistant remove the mirror from the warm water bath, quickly dry it, and place it in the patient's mouth. The mirror needs to be as far back as possible, ideally behind the second molars and tilted away from the maxillary teeth as far as possible to get a good shot. I stand behind the patient to get a good photograph of the mirror, shooting down into the patient's mouth. This process is repeated for the mandible, with the assistant and I trading places to get a good photograph of the mandible in the mirror. The mandibular arch is often trickier because of the tongue. You can instruct the patient to pull their tongue back as far as possible, which usually works to keep it out of the way, or have them lift it up, and then the assistant can place the mirror under it, effectively pushing it back and out of the way.

Using the above methods, I can get a complete set of high-quality photographs in 5 to 10 minutes. It takes practice, and I would encourage you to try different angles and techniques to find what works best in your hands.

Models and Bite Registration

An excellent set of models is imperative for a good workup. Minor problems become magnified later in the process, so you should accept nothing less than perfect. A single set should be fine if you are doing an initial workup because you are simply evaluating things. If you are completing a final workup, it is worth thinking through how many sets you need, which depends on your workflow for surgical planning. If you are doing VSP, you need a complete set to send off

for planning. If you are doing model surgery, of which I have done hundreds, you need multiple casts for redundant mountings to verify cross-mounts (very time-consuming and not enjoyable). If the maxillary surgery involves a multipiece surgery, then sending an uncut and a cut maxilla to the VSP company is wise. I generally get one extra set to pick the best one and compare for problems like distortion, blebs, or deviations when evaluating. For example, when I do a two-jaw surgery with a two-piece Le Fort, I will get two mandibular models and three maxillary models for the reasons mentioned above.

I make a caveat here that many surgeons have a completely digital workflow where they scan the occlusion and then set it virtually. Though this can be an excellent method in a skilled practitioner's hands, there are a lot of details in the process that demand understanding, so it remains important to learn both ways of navigating the process. Though I have found that virtually setting the occlusion generally produces excellent results, I always invite my orthodontist to join on the call to verify they are happy with the set occlusion to ensure I have their buy-in. I also know surgeons who practice with a hybrid system, taking their own impressions, modifying the occlusion as needed, then scanning that and sending it to a VSP company. There are many ways of hybridizing these systems, and I am sure they will continue to evolve (discussed in more detail later).

So how can you take excellent models on patients in braces? Several techniques are worth trying. Consider what we are trying to achieve with these models: Capturing the cusp tip relationship and translating that into a splint for use in surgery is the most important goal. With these models, I care much more about the occlusal half of the teeth and less about the rest. One technique is applying rope wax underneath the orthodontic wires and around and under the brackets to act as a blockout mechanism. Personally, after experimenting with this, I moved away from it and found that by simply pulling out the impression about 5 to 10 seconds before I usually would, the alginate would be at a perfect set. Too early and it will deform. Too late and it locks in and then rips or tears from the impression tray. I routinely use tray adhesive to help prevent this as well.

One tip my mentor gave me that I teach my residents is that you should take the impressions for a final workup yourself. So much of your surgical plan hinges on excellent impressions that you owe it to your patient to do that. A slightly less than ideal impression can translate to an incorrect surgical plan, and the downstream effect could be you in the operating room, trying to figure out why your splint doesn't fit. In all of this, I believe that you can increase the speed and predictability of your surgery in the operating room by optimizing the workup and preparation.

The bite registration has changed with the evolution of the workflow. For model surgery, you needed a bite registration trimmed to just the cusp tips to set the occlusion. However, for VSP, the company just scans the bite registration. So you can simply obtain a full bite registration, not trim it at all, and send it with the

models, or scan it if you are using a digital workflow. I prefer using what we all know as a "blue moose" product for this. If you use something else, it is always a good idea to check with the VSP company first to make sure they can use it. If you are doing a multipiece maxilla, you should send the clinical bite registration as well as a bite registration of a cut and set maxilla in the final position.

Radiographs

Radiology will be somewhat dictated by what the patient already has. Even a new patient will often bring in radiographs from their orthodontist if they have them. For a new patient, consider a panoramic radiograph and a lateral cephalometric radiograph or a CBCT scan to reconstruct these images. For a patient ready for surgery, a CBCT or medical-grade CT scan is necessary with a minimum slice thickness of 1 mm; either is acceptable for VSP. For multipiece Le Forts, ensure a way of measuring between the teeth where the cuts are proposed, either by measuring the CBCT or taking a separate dental periapical radiograph.

Surgical Discussion

With all the information and data collected, I then sit down with the patient (and their family if present), and we have a detailed discussion about the surgery. If the patient is just starting or has not yet started orthodontics, I first discuss the basics and goals of presurgical orthodontics. I explain how our teeth compensate for skeletal abnormalities and that the teeth often strive to touch. I use my hands to demonstrate a Class II (retrognathic) patient as an example and explain how the upper teeth tend to tip in and back and how the lower teeth tip out to try to touch. I then explain that one of the major goals of braces is to decompensate this problem by positioning the teeth correctly within each jaw relative to the alveolar bone. I emphasize that this will make their bite worse but that we must first unmask the problem to optimize surgical correction and harmonization of the facial structure.

If the patient is in the initial phase of treatment, a surgical plan is usually not finalized, or it may change during the orthodontic decompensation, so I describe both a Le Fort and a bilateral sagittal split osteotomy (BSSO) to the patient and explain that we will not know the final plan until they are closer to being ready for surgery. I use skull models to explain the approaches, the bony cuts, and how the bone is fixed with titanium plates. I also explain that the hardware generally will stay there for the rest of their lives and that it won't set off metal detectors.

Next, I describe the positions of the second and third divisions of the trigeminal nerve and how they are exposed and protected during surgery. I go into detail about the expected numbness (paresthesia) after surgery. I try to use simple analogies that everyone can understand and relate to, so I explain that it feels the way your arm does when it falls asleep and starts waking back up (tingly). I find that is the most relatable sensation most people understand. I explain

that it does not affect the way the fa[illegible]ves, and that even though we do these procedures very carefully to protect them, the nerves are incredibly sensitive and even operating near and around them can cause altered sensation. I tell them that normal sensation usually returns but can take weeks to months and even up to 1 year or more to fully recover. There is a chance, especially with the BSSO, that there will be an element of permanent paresthesia, up to full loss of sensation, though this is uncommon. I spend considerable time discussing the risk of paresthesia in detail because the patient will have altered sensation after surgery, and I want to ensure they understand, especially with a BSSO, that it is possible they will have permanent paresthesia or anesthesia.

I then describe what the time leading up to surgery will look like; the basics of VSP and how that process works; and the importance of high-quality models, scans, and photos. We then review recovery and the postsurgical phase, and I let them know that they may go home the day of surgery or spend (generally) one night in the hospital.

If I am doing a final workup with a referred patient who is ready for surgery, I spend more time discussing their proposed surgical plan and the VSP process, as well as what they can expect after surgery. When discussing expectations for postoperative pain, I like to set the bar low and then try to exceed it, which I have found tends to make patients happy. When high expectations don't match reality, it creates conflict. So I ask patients if they have ever had the flu and felt pretty miserable for a week or so. When they inevitably answer yes, I tell them they can expect to feel like that for about 2 weeks—tired and uncomfortable, even with pain medications. I have had patients recover from upper and lower jaw surgery without requiring any home narcotic medications, as well as some who experienced substantial discomfort for a prolonged period, so I try to set the expectations low (and then hopefully exceed them).

This brings us to one of the single most important points that I repeatedly emphasize before surgery, after surgery at the time of discharge, and at every postoperative visit: chewing. I first explain that there is a very small chance I will wire them together after surgery (maxillomandibular fixation) and that my preference is simply to have them in guiding elastics (discussed in later chapters). However, I tell them that if they chew anything between their teeth, they can break their jaws and then we must do surgery again (I have had this happen, so I can tell you it is real!). I then describe a 6-week, nonchewing diet. My favorite analogy for this is to tell them to pretend that they are an old person with no teeth. Anything they can smush using their tongue and roof of their mouth is okay to eat but only if they are extremely careful not to chew. Out of all the information we give patients, this is one of the most critical instructions, so I try to hammer the point home each visit to ensure as much compliance as possible.

Future chapters delineate more postoperative discussions, including exercises, specific medications, etc, so after reading those and becoming familiar

with them, you can blend in any more tailored discussion that suites your style. Remember, patients will judge your competence as a surgeon based on their interaction with you, so do everything you can to establish a good relationship and make them feel comfortable and supported in their care. I spend a little more time with folks than average during these visits to build a good relationship and make sure I answer all their questions. I believe it goes a long way in helping to create that special patient–doctor relationship.

Orthognathic Workup Template

The following template can be used for performing orthognathic evaluations. It is meant to be customized. Remove things you don't like, add things you do like, and make it yours. This is not a comprehensive list, but it should help guide you in performing an excellent workup.

An electronic copy of this template can be found here.

Orthognathic Workup Evaluation

Chief complaint: _____

Referring provider: _____

History of present illness: _____

MEDICAL HISTORY

Past medical history: _____

Past surgical history: _____

Medications: _____

Allergies: _____

Social history: _____

Family history: _____

OTHER QUESTIONS TO ASK

Any history of previous orthodontics? _____

Are third molars present? _____

Is obstructive sleep apnea a concern? _____

Is this the final evaluation? Are the orthodontic appliances passive? How long have they been passive?

_____

CRITICAL INFORMATION (TRIPLE CHECK!)

Tooth show in repose: _____

Maxillary midline relative to midsagittal plane: _____

Mandibular midline relative to midsagittal plane: _____

MEASUREMENTS

Frontal view

1. Facial fifths: _____
2. Brow position: _____
3. Brow-tip esthetic line: _____
4. Scleral show? _____
5. Nasal deviation (deviation, twist): _____
6. Tooth show in repose: _____
7. Tooth show in animation: _____
8. Gingival exposure while smiling: _____
9. Apertognathia: _____
10. Upper lip length: _____
11. Interlabial gap (lip incompetence): _____
12. Midlines relative to midsagittal plane
    a. Maxillary: _____
    b. Mandibular: _____
13. Buccal corridor fill (empty, full, narrow, etc): _____
14. Chin point relative to midsagittal plane: _____

Other notes: _____

Profile

1. Profile (concave, flat/straight, convex): _____
2. Facial thirds: _____
3. Cheekbone, nasal base, lip curvature line: _____
4. Midface hypoplasia (infraorbital soft tissue relative to globe): _____
5. Malar region: _____
6. Radix take-off point (high/low and shallow/deep): _____
7. Dorsal hump (absent, present, pseudohump): _____
8. Nasal projection (anterior/posterior, over- or underprojected): _____
9. Nasal tip rotation (superior/inferior, over- or underrotated): _____
10. Columellar show (minimal, normal, excessive): _____
11. Nasolabial angle (acute, normal, obtuse): _____
12. Labiomental fold (normal, deep/exaggerated, flattened/obliterated): _____
13. Lip strain: _____
14. Chin projection (balanced, macrogenia, microgenia): _____
15. Neck-throat point (well-defined, flattened, obfuscated): _____
16. Submental lipomatosis: _____

Other notes: _____

Intraoral

1. Maxillary and mandibilar arch form (wide, narrow, U-shaped, V-shaped, omega-shaped): _____
2. Spaces: _____
3. Missing teeth: _____
4. Crossbite: _____
5. Third molars (present or extraction date): _____
6. Molar class
   a. Right: _____
   b. Left: _____
7. Canine class
   a. Right: _____
   b. Left: _____
8. CR/CO shift: _____
9. Overbite: _____
10. Overjet: _____
11. Cant (if so, consider measuring and Fox plane photo): _____
12. Maximum incisal opening: _____
13. Curve of Spee (flat, normal, steep): _____
14. Intraoral pathology or concerns: _____
15. Oral hygiene: _____
16. Intraoral appliances (active, final surgical wire, powerchains, etc):_____
17. TMJ issues (if so, do a full TMJ exam): _____

Other notes: _____

Nasal

1. Cottle: _____
2. Septal deviation: _____
3. Inferior turbinate enlargement: _____
4. Dorsal hump (absent, present, pseudohump):_____
5. Projection (anterior/posterior): _____
6. Rotation of the tip (superior or inferior): _____
7. Alar base width:_____

Other notes: _____

BRIEF CLINICAL ASSESSMENT TO AID IN PLAN

Maxilla	Mandible	Dental	Soft tissue
• AP deficiency • AP excess • Transverse excess • Transverse deficiency • Vertical maxillary excess • Vertical maxillary deficiency • Asymmetry	• AP deficiency • AP excess • Transverse excess • Transverse deficiency • Asymmetry	• Class I/II/III malocclusion • Midline discrepancy • Impacted teeth	• Normal • Abnormal

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