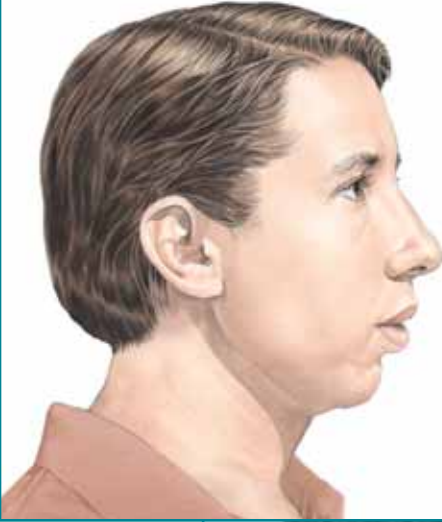


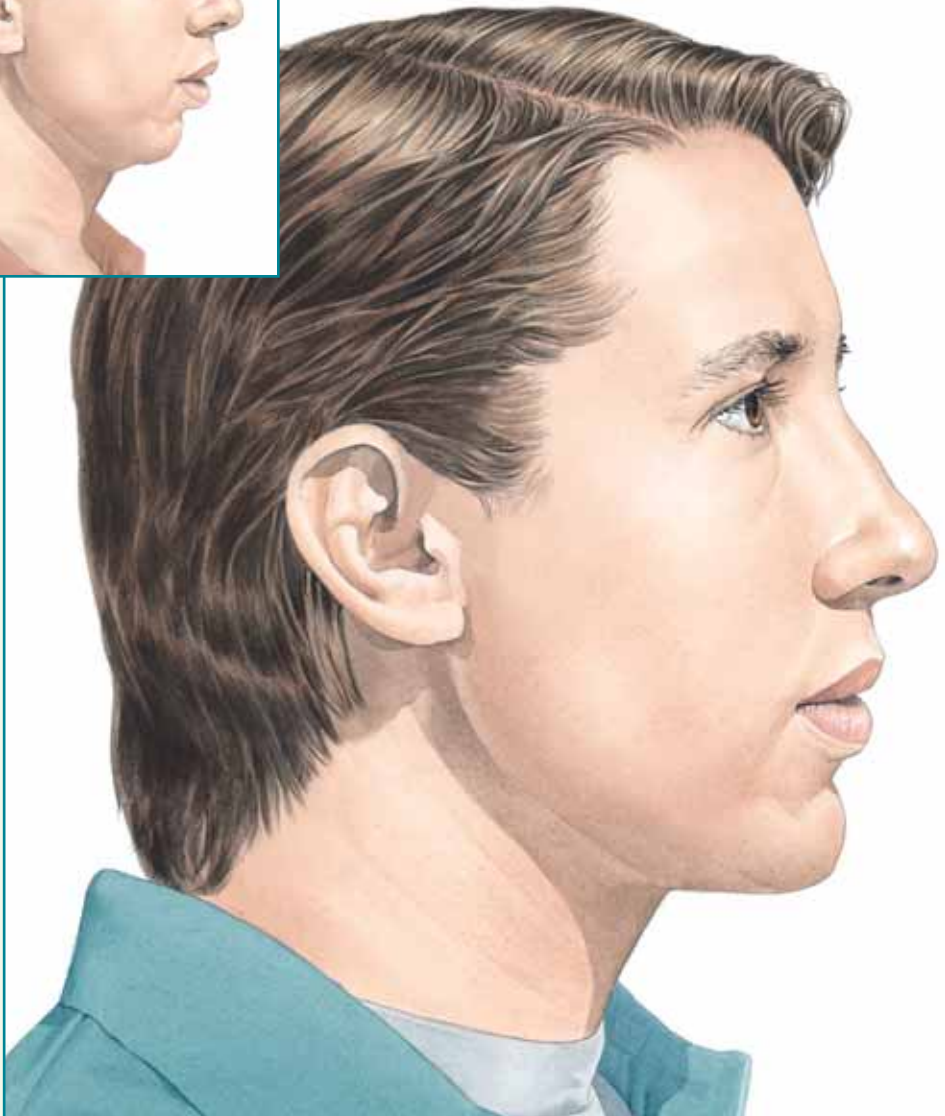
# Orthognathic Surgery

Improving Jaw Function  
and Facial Appearance

Before



After



# When Teeth and Jaws Don't Fit

Life can be awkward, even painful, when teeth and jaws don't fit together right. A jaw that's too small, too large, or crooked can cause problems with chewing, speaking, breathing, and even sleeping. The shape of your jaws also affects the way your face looks. **Orthognathic surgery** is a treatment that can reshape the jaws to help improve their form and function.

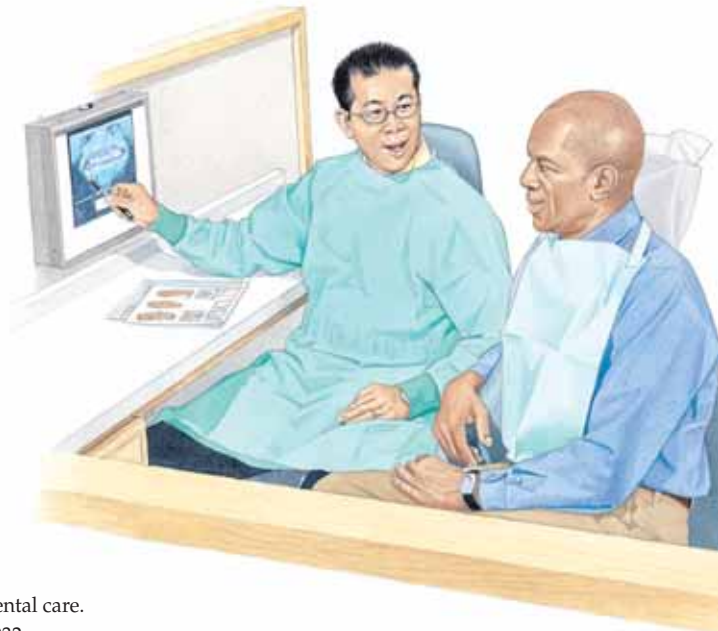
## How Orthognathic Surgery Can Help

Some people are born with poorly aligned jaws. Others develop problems as the bones grow or as a result of an injury. Orthognathic surgery realigns facial bones, making the jaws work together better. Surgery is only one part of the treatment process. In most cases, treatment to move and straighten the teeth (orthodontics) is needed before and after surgery. This combination of treatments can relieve the problems caused by teeth and jaws that are out of alignment.



## Your Role in Treatment

Orthognathic surgery and related treatments can take time, often over a year. Starting treatment and not completing it could leave you with more problems than you have now. So you need to commit to the full process before treatment begins. Learn about the stages of your treatment plan. That way, you'll know what to expect at each stage. You can also help ensure good results by taking good care of your teeth and your general health during and after treatment.



## Your Treatment Team

The people involved in your treatment include:

- **Oral and maxillofacial surgeon.** This surgeon performs surgery on jaws and facial bones.
- **Orthodontist.** This is a dental specialist who can improve the function and appearance of teeth by moving them into better positions in the jaws.
- **General dentist and other dental specialists.** A general dentist treats a wide variety of dental problems. Depending on your needs, you may also see dental specialists. For example, you may see a periodontist if you have gum disease, or a prosthodontist if you need a crown, bridge, or implant.
- **Other professionals.** In some cases, a speech therapist, physical therapist, or other professional can help you make the most of treatment benefits.



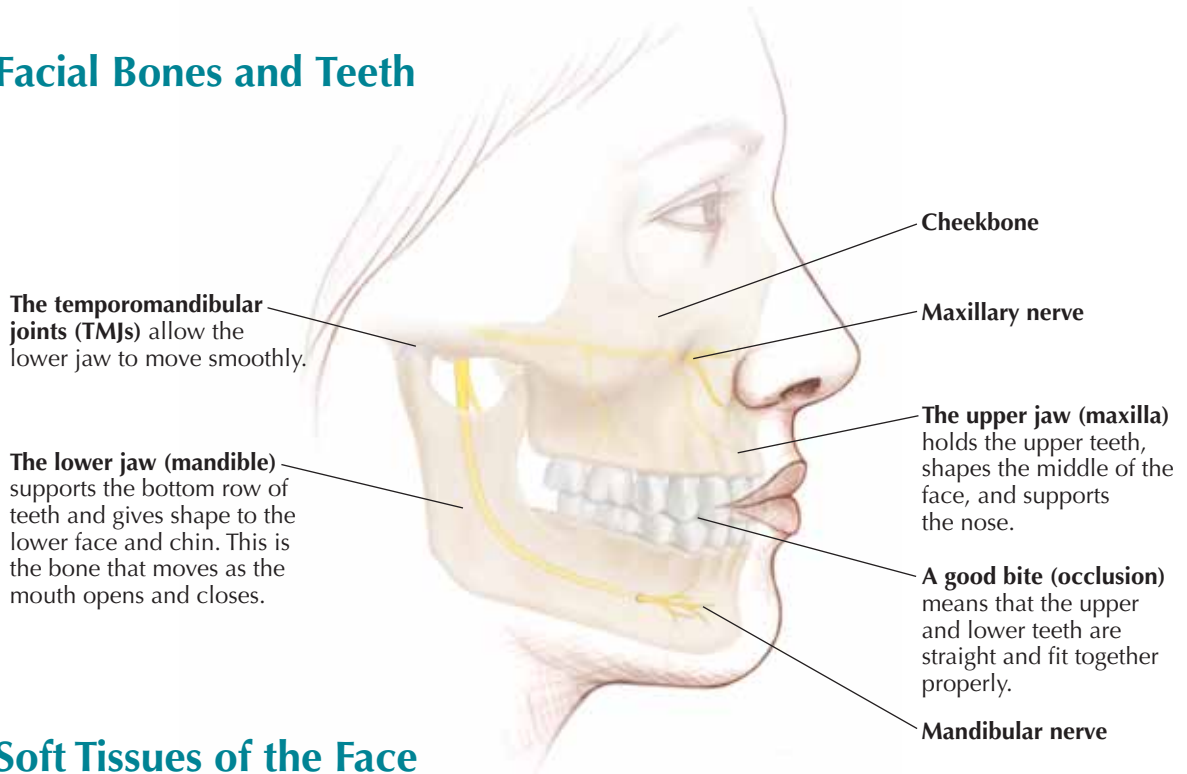
## Table of Contents

How Bones and Teeth Shape the Face. . . . .	4
Your Diagnosis and Treatment Plan. . . . .	6
Presurgical Orthodontics . . . . .	8
Preparing for Surgery . . . . .	9
Types of Surgery . . . . .	10
Your Surgical Experience . . . . .	12
Recovering at Home. . . . .	14
Completing Your Treatment. . . . .	15

# How Bones and Teeth Shape the Face

Bones are the framework for the face. The size and position of facial bones determine how well the teeth fit together. Together, the positions of the jaws and teeth affect chewing, speaking, and the working of the jaw joint. The jaws also hold and support soft tissues, such as the muscles, lips, and tongue. And of course the jaws and teeth are major players in the face's shape and appearance.

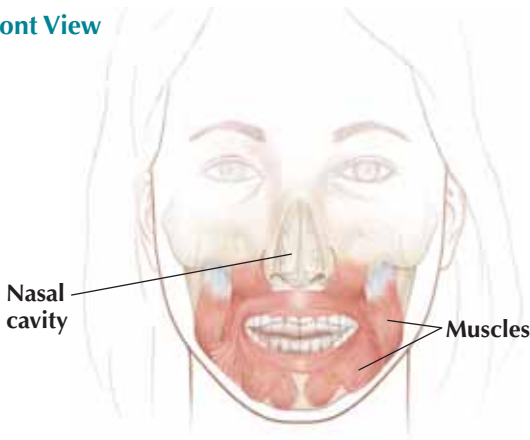
## Facial Bones and Teeth



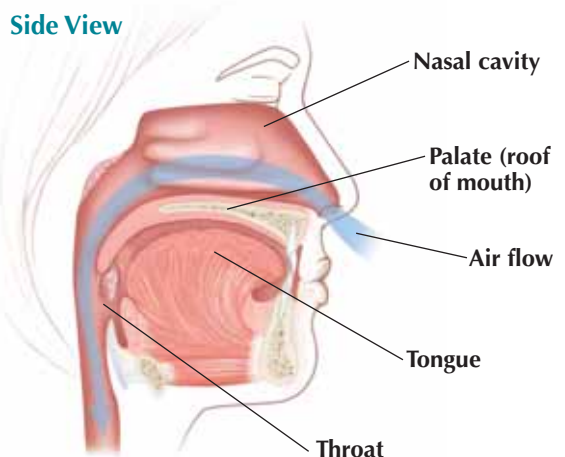
## Soft Tissues of the Face

The lower jaw holds the tongue, which moves freely as you speak and eat. The upper jaw shapes the floor of the nasal cavity, allowing normal airflow. Normally, muscles are evenly developed on both sides of the face.

### Front View



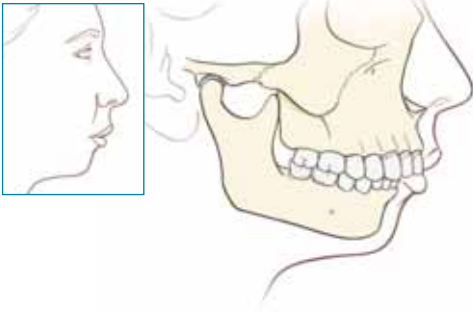
### Side View



## Common Problems

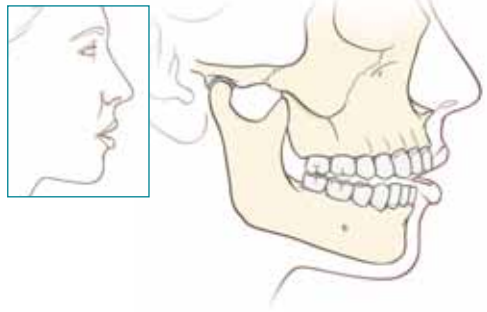
Some common jaw alignment problems are shown below. It's also common to have a combination of these problems.

### Lower Jaw Too Far Back



When the lower jaw is too far back (retrognathia), biting can be difficult. The chin appears weak or receding.

### Open Bite (Teeth Don't Meet)



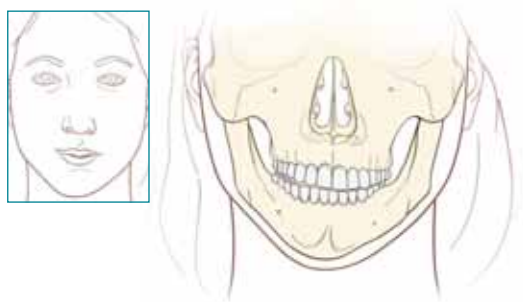
An open bite is often due to a long upper jaw. This can cause a "gummy smile." Or the problem may be that the rear of the lower jaw is too short. An open bite can make it impossible to close the lips.

### Lower Jaw Too Far Forward



A lower jaw that is too far forward (prognathia) causes the chin to protrude. Lower teeth may jut outward or overlap the upper teeth.

### Asymmetry (Jaws Are Uneven)



Uneven jaws are larger or smaller on one side than on the other. Or one side may be too far forward or back. The face may look off-center or crooked.

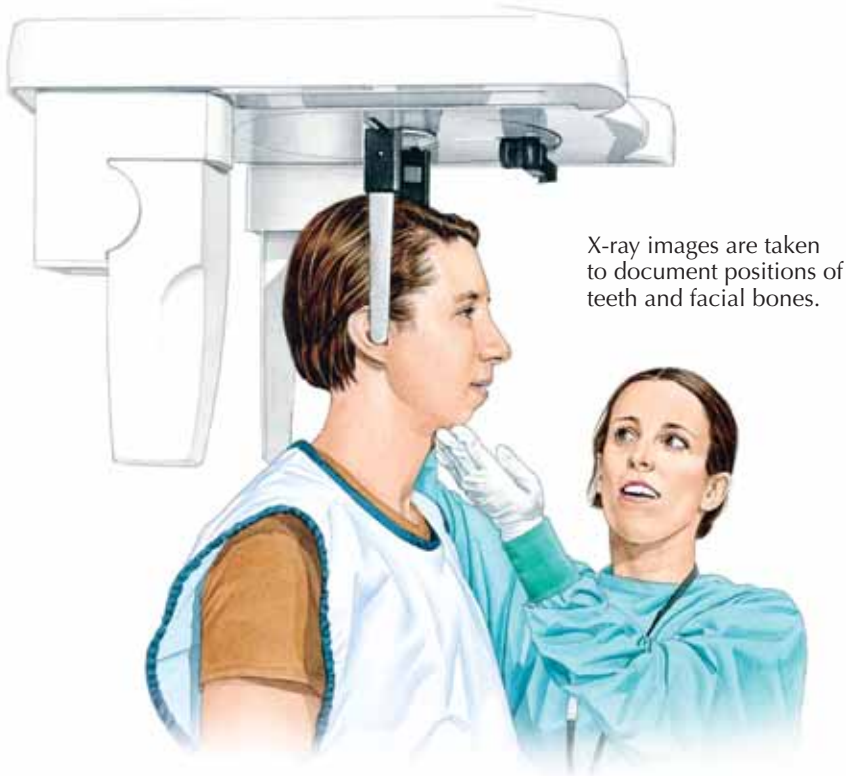
## When Jaws Are Not Aligned

Poorly aligned jaws can result in a variety of problems, including:

- **Chewing problems.** You may find it difficult to bite into a sandwich or an apple, or difficult to keep food in the mouth as you chew. The TMJs may be stiff or painful.
- **Speech problems.** It may be difficult to make certain sounds or to speak clearly.
- **Breathing problems.** If the airway is narrowed or blocked, breathing may be noisy or difficult. You may have sleep apnea (breathing that stops during sleep).
- **Problems with appearance.** You may be unhappy with the way you look. This can make you self-conscious and may affect your confidence.

# Your Diagnosis and Treatment Plan

To identify the exact problems that need to be corrected, information about your jaws, teeth, and general health will be gathered. Your surgeon and orthodontist will use this information to create a treatment plan. The evaluation process takes a few weeks.



X-ray images are taken to document positions of teeth and facial bones.

## Your Exams and Records

Your surgeon and orthodontist will perform exams and take records (pictures, x-rays, and models that document the current positions of the teeth and jaws). Some of the same records may be taken by both your orthodontist and surgeon. Exams and records may include:

- **A medical history.** This includes questions about previous surgeries, injuries, general health, and dental health. Be sure to mention any plans for future dental work or facial cosmetic work.
- **A physical exam.** You'll be asked to open and close your mouth to test how your jaws and teeth work together. The health of your gums and teeth will also be checked.
- **Photographs and videos.** These may include photographs of the jaws, teeth, and face, and videos of you smiling or talking.
- **X-rays.** These show details of bones and teeth. **Panoramic** x-rays image the entire mouth. **Cephalometric** x-rays image the entire skull. Images of individual teeth may also be taken.
- **Casts.** A mold of the teeth is taken and plaster casts are then made from the mold. These show the fit of your teeth and jaws and can be moved to simulate chewing.
- **Other evaluations.** In some cases a sleep study, speech evaluation, psychological evaluation, or other evaluation is needed.

## Forming a Treatment Plan

You will work with members of your treatment team to create a treatment plan. For the plan to be effective, you and your treatment team need to agree on goals. Be sure you understand what each step involves, and what you can and can't expect from treatment. A typical treatment plan begins with orthodontics and other dental work. Surgery is next, followed by more orthodontic work. But plans can differ depending on the jaw problem and factors such as your age and your general oral health. Your plan will likely include a time frame for each stage of treatment.



## Treatment Stages and Time Frames

At the start of treatment, it can be hard to predict exactly how much time each stage will take. So be prepared to be flexible. Your team will tell you if a treatment stage is likely to take a longer or shorter time than first expected. Typical stages and time frames are shown here.

Stage	Duration	Description
<b>Diagnosis and Treatment Plan</b>	1–4 weeks	<ul style="list-style-type: none"><li>• Exams and tests</li><li>• Surgeon and orthodontist consult together</li><li>• Meet with team members to discuss overall plan</li></ul>
<b>Preparation for Surgery</b>	12–18 months	<ul style="list-style-type: none"><li>• Dental work</li><li>• Orthodontic work (braces) and regular checkups</li><li>• Meet with surgeon to prepare for surgery and recovery</li><li>• Quit smoking (if you smoke)</li></ul>
<b>Surgery and Hospital Recovery</b>	1–3 days	<ul style="list-style-type: none"><li>• Surgery</li><li>• Observation in the hospital while you recover from anesthesia and get started on a liquid diet</li></ul>
<b>Recovery at Home</b>	2–6 weeks	<ul style="list-style-type: none"><li>• Rest at home; on a soft diet for 2 or more weeks</li><li>• Postoperative exam by surgeon</li><li>• Gradual return to normal eating and normal oral hygiene</li></ul>
<b>Postsurgical Treatment</b>	6–12 months	<ul style="list-style-type: none"><li>• Complete orthodontic treatment</li><li>• Follow-up with surgeon as needed</li><li>• Routine dental care</li><li>• Other dental care, if needed</li></ul>

# Presurgical Orthodontics

Before surgery, most people need to have orthodontic treatment to move and straighten the teeth. This allows the surgeon to place the jaws in the proper position. Dental work is also needed throughout the process. This presurgical phase is often the longest phase of treatment.

## Preparing Your Mouth for Braces

To support the teeth, the gums and underlying bone need to be healthy. So you'll need to keep up with routine dental care throughout the treatment process. All cavities should be filled before surgery. If you have periodontal (gum) disease, you'll see a periodontist or general dentist for treatment. Other dental problems may also need work. For example, if you have wisdom teeth, they will most likely need to be removed before you get braces. When your teeth and gums are ready, you'll go on to the next step.



## Getting Your Braces

Braces help ensure that the placement of your teeth will work well with the position of your jaws after surgery. The braces use gentle pressure to slowly shift teeth into their new positions. Modern orthodontic treatment uses very mild pressure to reduce discomfort. Also, modern braces are less noticeable than old-fashioned braces. While you have braces, you'll need to avoid certain hard or sticky foods. You'll also need to be extra careful about brushing and flossing your teeth. Your orthodontist and his or her staff will tell you more about taking care of your braces and your teeth.



# Preparing for Surgery

During the months leading up to surgery, you'll work with your orthodontist. Your orthodontist will keep you and your surgeon updated on when your teeth are likely to be in the right positions for surgery. You'll be given plenty of time to get ready for surgery and plan your recovery.

## Seeing Your Orthodontist

During this period, you'll see your orthodontist often. At these visits, he or she will check your progress. Your braces may be adjusted. More records may be taken. Your orthodontist will tell you if the time line needs to be revised, and will update your surgeon. Remember, treatment is designed to give you a good bite *after* surgery. At this stage, it may feel like your bite is getting worse. That will change after surgery! Discuss any concerns about your bite with your orthodontist.



## Meeting with Your Surgeon

Shortly before surgery you'll meet with your surgeon. He or she will evaluate your progress and finalize the surgical plan. You'll discuss factors that could affect surgery, such as medications and allergies. You'll also have an exam and blood tests to make sure you're healthy enough for surgery. Depending on various factors, you may also need other tests, such as a chest x-ray.

## What You Can Do to Prepare

During the months before surgery, there's a lot you can do to make your treatment and recovery easier. For example:

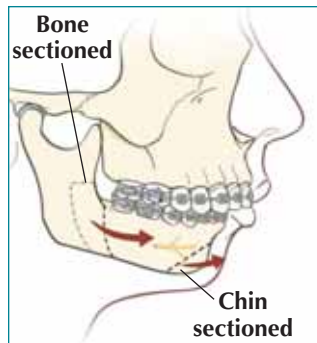
- **If you smoke, quit.** Smoking increases the risk of complications during surgery. It slows healing after surgery. It can also cause or worsen gum disease. The sooner you quit, the better. Ask your primary healthcare provider to help you make a plan to quit smoking.
- **Arrange for time off to recover.** Planning in advance helps make your absence from school or work go smoothly. Ask your surgeon how long your home recovery is likely to take.
- **Learn about your recovery.** After surgery, you won't be able to chew at first. In some cases the jaw is held shut (immobilized) for about 2 weeks. So you'll need to learn what to eat, how to eat, and how to stay comfortable.
- **Make medication changes as directed.** Be sure your surgeon knows about any medications, herbs, or supplements you take. You may be advised to make changes a few weeks before surgery.

# Types of Surgery

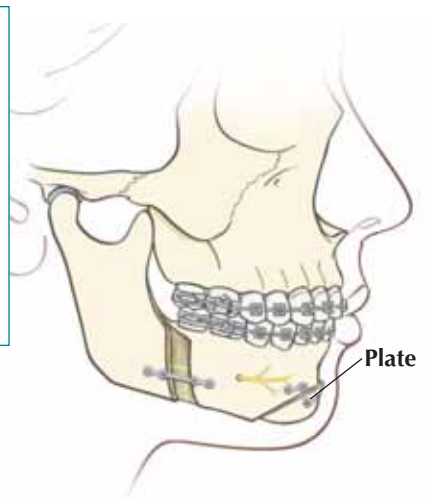
The exact details of your surgery will depend on the problem being corrected. To avoid visible scars, incisions are made inside the mouth. Braces remain on during and after surgery. In many surgeries, fixation devices are used to hold bones in place after they have been moved. These pages show procedures used to correct some common problems.

## Underdeveloped Lower Jaw

The goal is to bring the lower jaw forward so that it's more in balance with the rest of the face. The lower jaw is first divided into two or more parts. The jaw is then moved forward into a new position. A piece of the chin may also be moved (genioplasty). As bone is moved, muscles and soft tissue remain attached.

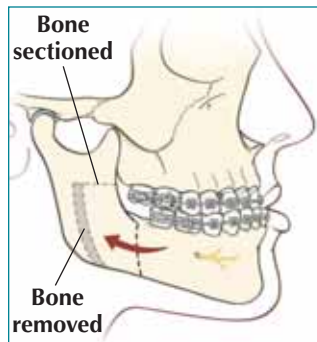


One or more sections of the lower jaw are moved forward. The chin may also be brought forward.

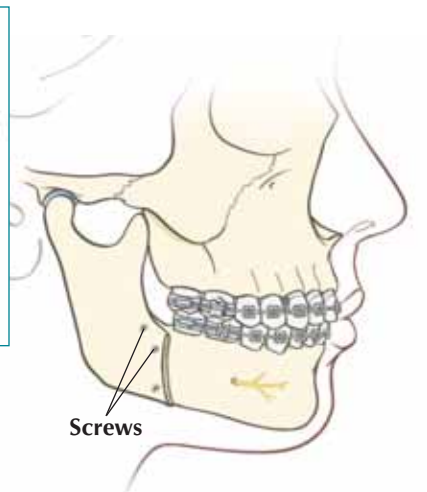


## Overdeveloped Lower Jaw

The lower jaw is moved back to make it less prominent and to place the lower teeth behind the upper teeth. The lower jaw is divided into sections and some bone may be removed. The jaw is then moved back. The muscles and soft tissue remain attached to the jaw.



The lower jaw is cut, and the front section is moved back.

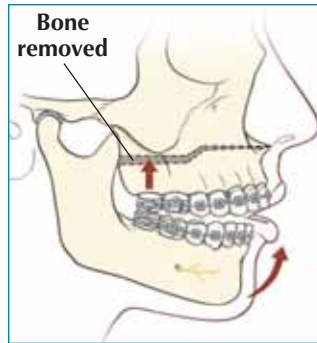


## What Is Fixation?

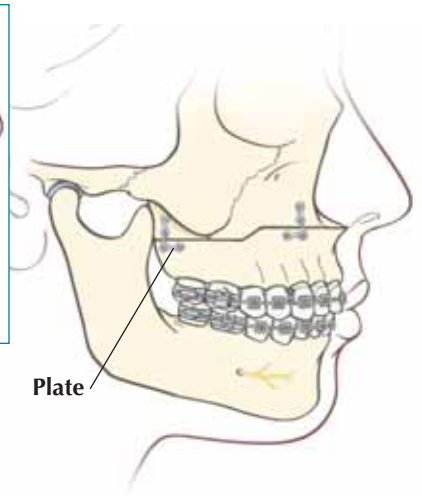
In most surgeries, **fixation devices** (screws, plates, and wires) are used to hold the bones together. Bone will eventually heal so that the fixation devices are no longer needed. But there's no need to remove these devices. They are left in place permanently. You won't be able to feel or see them, since muscles and soft tissue keep the contours of the jaw smooth and natural-looking. In rare cases, the surgeon will use "resorbable" screws or plates. These are absorbed by the bone and eventually disappear.

## Open Bite

For an open bite, the jaws need to be repositioned to allow the mouth to close. To do this, a wedge of bone may be taken from the upper jaw, making it shorter. This corrects a long upper jaw (gummy smile). Surgery on the lower jaw may be done at the same time. Muscles and soft tissue are left intact.



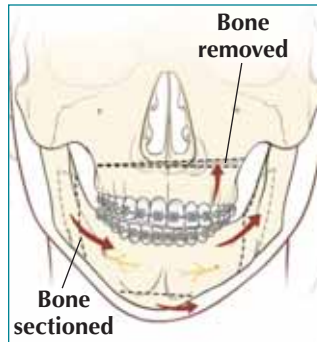
Bone is removed from the upper jaw to shorten it.



Plate

## Asymmetry

The goal is to make the jaws the same length on both sides. A wedge of bone may be removed from the longer side of the jaw. This can then be used to lengthen the shorter side. One side of the upper jaw may be moved up or down to even things out vertically. The shape of the chin may also be altered (genioplasty). If more bone is needed, it may be taken from another part of the body. The muscles and soft tissue remain attached to the jaw.



The two sides of the jaws are lengthened or shortened as needed.

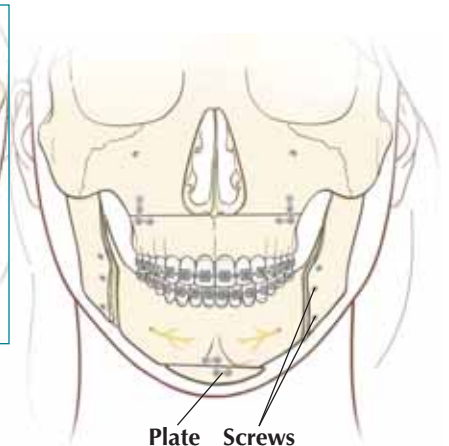


Plate Screws

# Your Surgical Experience

Surgery takes place in a hospital or surgery center. The procedure lasts several hours. You will likely stay in the hospital for 1 to 2 days. In some cases it may be possible to leave the same day. In either case, hospital staff will keep you comfortable and help you recover until you're ready to go home.

## Before Surgery

A day or two before your surgery:

- Stock up on liquid foods you can eat without chewing. These include total-nutrition drinks, soup, and milk. Foods that are easy to liquefy, such as bananas, are good, too.
- If you don't already have a blender, buy or borrow one.
- Arrange for an adult family member or friend to give you a ride home and stay with you after surgery.
- Don't eat or drink for at least 8 hours before surgery. Ask the surgeon whether to take your regular medications during this period. If so, take them with small sips of water.



Stocking up on easy-to-eat foods will help make your recovery more comfortable.

## The Day of Surgery

When you arrive at the hospital, you'll change into a hospital gown. Staff will then prepare you for surgery. An IV line will be started to provide you with fluids and medications. Before surgery you'll meet with your anesthesiologist or a nurse anesthetist. This is to discuss the medication (general anesthesia) used to keep you asleep and free of pain during surgery. Once you're under anesthesia, the surgery will be performed. To help stabilize the bite, a plastic splint may be placed between the chewing surfaces of your teeth. In some cases, elastic bands or wires are attached to the braces to hold the jaws firmly shut. In other cases, looser elastic bands called "guiding elastics" are used. Sometimes, no wires or bands are needed.

## Risks and Complications

Risks and possible complications of surgery include:

- Temporary pain and swelling
- Bleeding
- Numbness (in most cases temporary)
- Infection
- Loss of teeth or bone
- Relapse (bones move back toward original positions)
- Risks of anesthesia

## Right After Surgery

After surgery you'll awake in a recovery room. Your IV will remain in place. You'll most likely have a device to give you oxygen. Ice packs will be applied to your face to control swelling. Your face will most likely be numb, but you'll be given medication if you feel any pain. Nurses will monitor you to make sure you're recovering well from anesthesia. You'll then be taken to a regular hospital room.

## Recovering in the Hospital

You'll be urged to get up and walk as soon as possible after surgery. This helps you recover from anesthesia. It also helps prevent complications. Sometime later in the day, you'll likely be started on liquids. Using facial muscles helps reduce swelling, so try to talk if you can. It's common to have some nausea the first day. Vomiting when you can't open your jaws can be scary, but don't panic. Since you fasted before surgery and you're now taking only liquids, the vomit will be liquid. Just lean over and spit it out. If you have any concerns about how nausea may affect you, talk to your surgeon ahead of time.



## Going Home

You will most likely stay in the hospital overnight, or for up to 2 days. You can go home when you're up and around, you have no signs of complications, and any nausea is under control. Before you leave, you'll be told how to reduce pain, swelling, and nausea at home. You'll also be given prescriptions for medications to help control these problems.



Be sure to have an adult family member or friend drive you home.

# Recovering at Home

Your job now is to keep yourself comfortable and help your body heal quickly. Make sure to get plenty of calories and protein. Get up and move around, but avoid strenuous activity. Be sure to get lots of rest. Keeping your mouth and teeth clean will help the incisions heal.

## Controlling Swelling and Pain

For the first few days, swelling will likely increase. It should then start to ease. To reduce swelling and pain:

- Sit or lie with your head and shoulders higher than your heart.
- Apply an ice pack to your face for 10 minutes at a time, with breaks of at least 5 minutes in between. Keep a thin cloth between the cold source and your skin.
- Use pain medications as directed.

## Nutrition and Fluids

You will need to get enough nutrition, which may be harder while you can't chew. You also need fluids to help prevent dehydration and nausea. For calories, protein, and fluids, try total-nutrition drinks, protein powders, soups, milk shakes, and other blended foods. Don't use a straw, since the suction can stress the incisions in your mouth. Instead, use a glass or a "sippy cup" designed for young children. Once you can chew again, you can eat foods soft enough to cut with a spoon or fork. Then you'll gradually work your way back to your normal eating habits.

## Keeping Your Mouth and Teeth Clean

To keep your teeth as clean as possible:

- If you can't open your jaws, brush the front surfaces of teeth with a baby toothbrush.
- If a fluoride toothpaste or mouth rinse is prescribed, use it as directed.
- If your surgeon advises it, start using an oral irrigator about 10 days after surgery.
- Aim to get back to brushing and flossing normally as soon as you can.



## When to Call Your Surgeon

If you have any of the following problems, call your surgeon. Go to the emergency department if your doctor's office is closed.

- Severe bleeding
- Pain that can't be controlled
- Nausea or vomiting that can't be controlled
- Swelling that continues to worsen after 3 to 4 days
- A fever of 101°F (38.3°C) or higher

# Completing Your Treatment

Surgery isn't the end of your treatment. You still need orthodontic work to perfect your bite. And you'll need ongoing care and follow-up. Keep in mind, too, that as the bones heal, the shape of your face may continue to change in subtle ways for up to a year.

## Follow-up with Your Surgeon

You'll see your surgeon soon after surgery. X-rays may be taken to check on how you're healing. If wires or elastic bands were used, they will most likely be removed or adjusted. This process takes just a few minutes, and in most cases causes little or no discomfort. You may be given special exercises to help retrain the muscles you use to open and close your jaws. Over time, your surgeon will monitor healing and make sure that bones and teeth are aligning as originally planned.



## Fine-Tuning Your Bite

Now that your jaw has been reshaped, your bite will look and feel better. But you will still need to continue orthodontic treatment. You'll see your orthodontist often during this stage, which often lasts 6 to 12 months. Once your braces are taken off, you will use a finishing appliance such as a retainer. This is a removable plastic or metal-and-plastic device. It helps keep the teeth from moving out of their new positions.

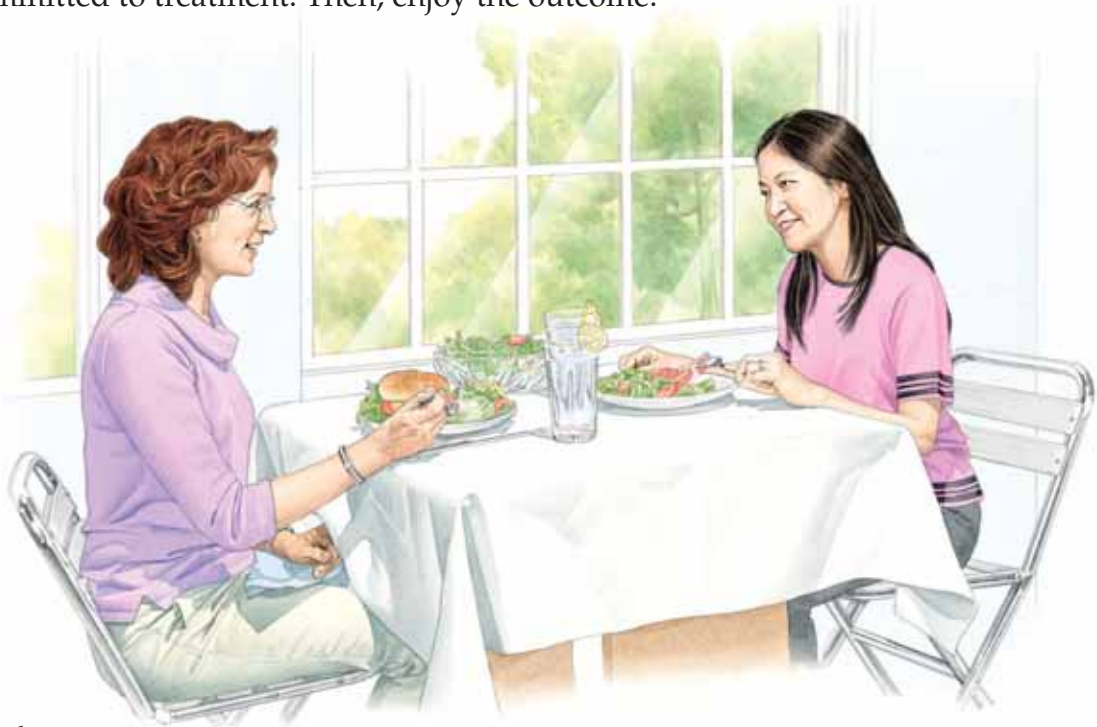
## Your Long-Term Care

After your braces are off, you may still need to have other dental work. Use your finishing appliance as directed. Doing this can help preserve your beautiful new smile. Get regular dental care to prevent or control gum disease and tooth decay. Home care (brushing and flossing) is a key part of your ongoing treatment, too.



# Feeling Better, Looking Great

Orthognathic surgery and related treatments can take time. So keep the payoff in mind. Your goal may be better jaw function or improved appearance or both. Whatever your goals, stay committed to treatment. Then, enjoy the outcome!



**Consultants:**

Felice O’Ryan, DDS, Oral & Maxillofacial Surgery  
Gerald Nelson, DDS, Orthodontics

**With contributions by:**

Mark E. Beehner, DDS, MD, Oral & Maxillofacial Surgery  
David A. Bitonti, DMD, Oral & Maxillofacial Surgery  
W. Stephan Eakle, DDS, General Dentistry  
Gerald S. Fine, DDS, Oral & Maxillofacial Surgery  
Yan Kalika, DMD, MS, Orthodontics  
David B. Poor, DMD, Oral & Maxillofacial Surgery  
Fred W. Salvatoriello, DMD, Orthodontics  
Howard Stringert, DDS, MS, PC, Orthodontics

After treatment is complete, you can enjoy many simple activities that were once difficult.

**KRAMES**<sup>®</sup>  
**PATIENT EDUCATION**

*A MediMedia Company*

[www.krames.com](http://www.krames.com) 800-333-3032