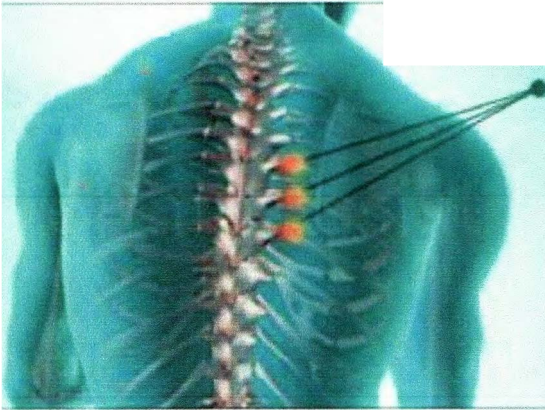


This article was dictated and written by my esteemed colleague, Dr. Michael Brown, M.D. DC. Dr. Brown was a wonderful teacher and superb doctor who passed away too young. The information dictated by Dr. Brown still remains pertinent today and I corrected spelling and grammar to make it more easily readable and I find it useful to provide to my patients. I hope you like it.

Charles F Mahl M.D.

A misdiagnosed & misunderstood cause of chronic mid-back pain



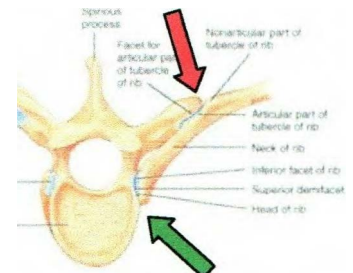
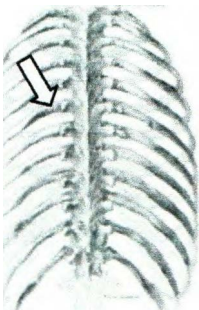
INTRODUCTION TO COSTOVERTEBRAL / COSTOTRANSVERSE JOINT PAIN:



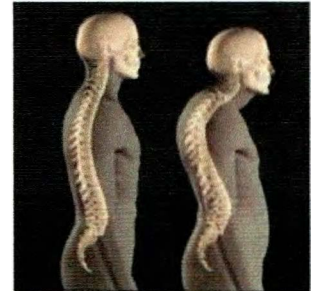
Our practice typically sees patients who have had persistent pain in the spine or joints that have failed all conservative care. So it is not uncommon for us to see patients that describe persistent pain in the mid-back which is felt just off to one side of the spine. They have often sought care from physical therapists, chiropractors, osteopathic physicians, massage therapist or have undergone multiple trigger point injections. They may or may not have had transient relief of pain with this treatment but the pain returns quickly. Sometimes this condition can actually be irritated by manipulation and thus patients may have given up on manipulation treatment because it temporarily worsens the complaint. This article addresses this particular syndrome which is quite frequently under diagnosed and misunderstood and therefore individuals can go on for years having persistent pain and never having realized they actually have a treatable condition.

WHAT IS THE COSTOTRANSVERSE JOINT?

The costotransverse joint is a junction between the rib and the transverse process of your thoracic vertebra. You can see that junction at the red arrow noted on the picture to the right. There is a second “rib and vertebral” joint as well. That is called the costovertebral joint noted at the Green arrow to the right.



There are actually different types of rib and vertebral joints in the body at different regions of the mid back but that is for anatomy “buffs” and we will not be going into that much anatomical detail. These joints are held together by ligaments which are made of connective tissue that can be sprained. On occasion the rib and junction to the vertebra can become arthritic and become a source of pain from the osteoarthritic changes of the joint. Other times, gradual postural changes such as a gradual increase in the curve of the back as noted in the picture to the right can place stress on the rib and spine joints and become another reason patients develop pain in this area.



WHAT MAKES US VULNERABLE TO DEVELOPING THIS?

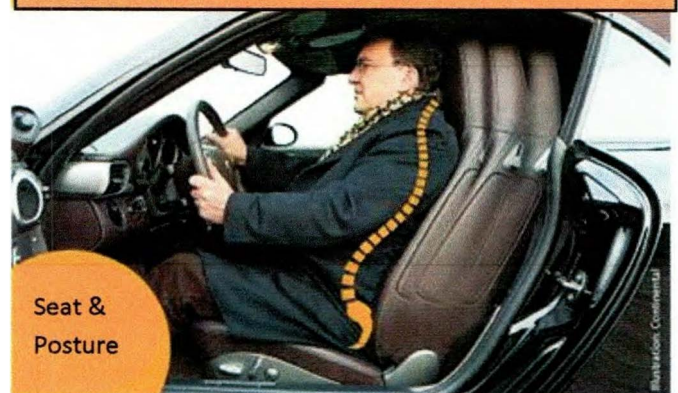
When patients are overweight there is a significant increased stress placed on these joints and make an individual vulnerable to injury. Once injured an individual may have persistent pain that does not respond to any care provided which may include physical and manual therapies.



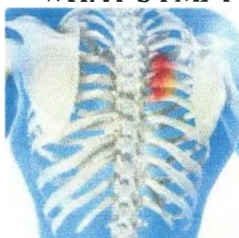
The increased weight causes extra stress on the rib joints because of the amount of body weight carried in the front of the body as well as the increased curve in the mid back. Slip and fall accidents may cause this. It is relatively common place for me to see injuries in the costotransverse joints and costovertebral joints in motor vehicle accidents especially rear end collisions. The reason for this is that

even with a normal spinal curvature and normal body weight the seat back contacts the mid back area and during a rear end collision the seat back at impact significant force can be placed through the rib cage can cause sprain to these joints. This can be much worse if you're overweight. When you are struck from the rear and you have an increase spinal curve the pressure applied by the seat back can be significant depending on the speed of impact and pre-existing arthritic changes and other factors that may make your spine more vulnerable to injury.

Auto seat posture – the set up for spine injury

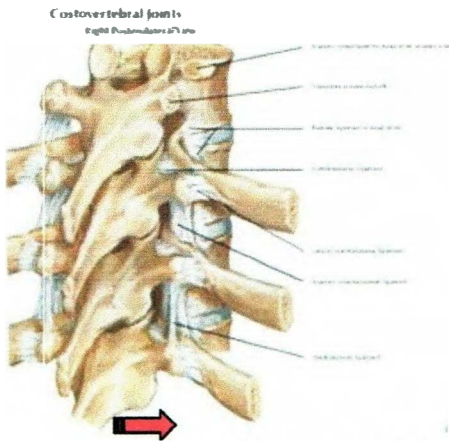


WHAT SYMPTOMS DOES THIS CONDITION CAUSE?



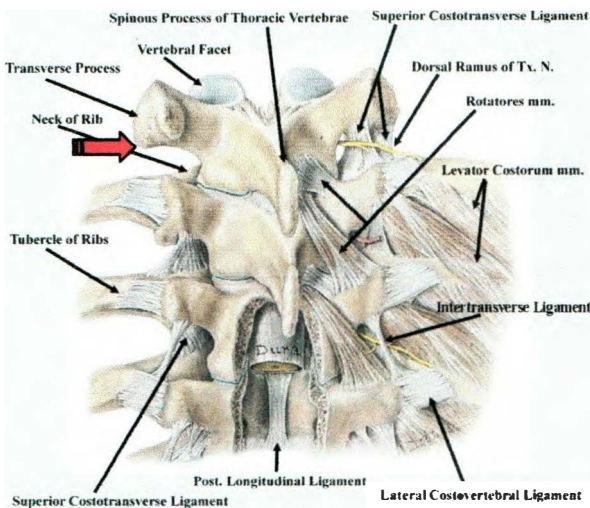
Typically pain from the costotransverse joint causes pain just inside your shoulder blade over the rib. Thus, pain is typically in the location in the red zone noted in the picture to the left. But this is not all that can occur with pain

arising from these joints. Pain from the joint will also cause the muscles around the area to become sore and tender and therefore often be mistaken for muscular pain and treated as such. Pain from this joint can refer into the front of your chest and may be diagnosed as chest

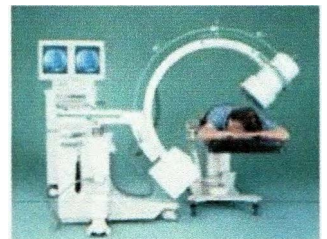


pain from other sources or as a costochondritis a condition of the rib in the front of your chest. The most common complaint however is typically pain over the rib joint itself which is often described by patients as pain just inside the shoulder blade. The pain from these joints can become much more intense than typically experienced by simple muscular pain and the pain intensity may be the first clinical sign to look closer for this potential source of pain. The source of pain from the costotransverse joint is typically the ligament that supports the joint shown in red on the pictures to the left. As a previous practicing chiropractor I can recall being very frustrated with this particular syndrome because I was very aware of the source

of the pain but felt helpless to be able to solve the problem. Even exercise, strengthening, change in posture, and medications were not helping my patients. As I advanced my education and expanded my clinical abilities I directed attention to this problematic area that had been so frustrating in my previous career.



In years past I utilized x-rays in the form of fluoroscopy seen in the picture to the right. The problem with this was the exposure to x-ray. Over the years as I began to become trained in musculoskeletal ultrasonography and having an opportunity to work in a ultrasound research lab in the pain medicine Department at the University of Washington. There I began to learn how to access these joints using ultrasound. Ultrasound provides a distinct



advantage because not only continue see the complexity of soft tissue structures noted in the picture to the left but you can also see the lung field below the rib.



As you can see from the ultrasound picture to the left you can clearly see that a needle can be easily visualized and directed to a specific target. Because an ultrasound image of the rib can also show the lung field and the covering over the lung

call the “pleura” you can perform these injections with ultrasonography with much less risk than doing these procedures blind.

HOW ARE THESE JOINT PROBLEMS TREATED?

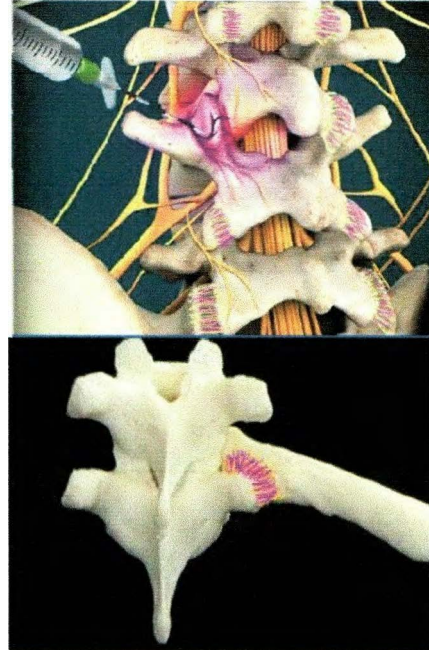
Remember the spinal joints as shown in pink on the picture to the right are housed in ligaments that support the joint. These joints are common source of pain. We typically perform diagnostic local anesthetic and anti-inflammatory medications on the ligaments or the nerves that supply the ligaments. These same local anesthetics and anti-inflammatory medications can be injected on the costotransverse joint (rib and transverse process joint) as seen in the picture to the right. About 4 out of 10 patients that undergo the diagnostic test with anti-inflammatory medications go on to have lasting relief of pain and did not need additional treatment.

Depending on the severity of injury and/or severity of the condition sometimes we have to strengthen the ligament attachment to the rib. There are actually multiple ways to strengthen the ligaments of the costotransverse joints. One of the treatments as a method using “prolotherapy.” This method involves the use of dextrose sugar injections directed to the ligament attachments which causes a proliferation of collagen. The collagen strengthens the joint and heels the joint instability. Another way is to inject the

ligament with platelet rich plasma, a substance that is made from your own blood. In this treatment and blood sample was taken from a vein in your arm and the blood. This process to separate platelets that have healing, growth factors within them. The growth factors are used to heal the ligaments. We will discuss more about PRP below. In addition to PRP. We can also use extracellular matrix and scaffolding proteins obtained from human placental tissues prepared in FDA approved labs. Stem cells can also be used. However, it is much more rare that we have to use stem cells to resolve costotransverse joint syndromes. These injections regardless of the type is performed under ultrasound guidance the same way the diagnostic injection is performed. We typically have exce use of platelet rich plasma injection below.

PLATELET RICH PLASMA INJECTION (PRP):

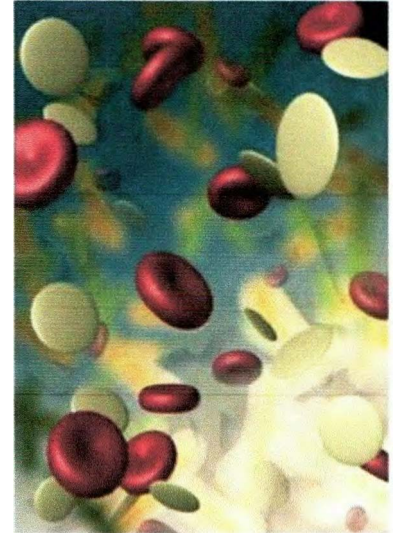
We utilize cells that we obtain from your blood for this procedure. The platelets and your blood have a high concentration of growth factors that are used to affect tissue repair, regeneration and healing.



Why platelets?

Platelets are very complicated and dynamic cells involved in a myriad of biologic processes in your body. Platelets are responsible for sticking to each other and stopping initial bleeding after injury. Once activated they also initiate the clotting cascade as well as release numerous growth factors which stimulate the proliferation of collagen connective tissue, new blood vessels and tissue regeneration and healing. The growth factors contained within platelets provide a powerful stimulus for tissue healing and regeneration. It is your platelets that are often responsible for initiating a healing cascade in soft tissue injuries such as abrasions and lacerations.

The rationale therefore for utilizing platelets is to take advantage of the myriad of growth factors derived from platelets that alter healing response and tissue regeneration. These growth factors include TGF- β , platelet derived growth factor (IGF), vascular endothelial growth factors (VEGF), epidermal growth factor (EGF), fibroblastic growth factor -2 (FGF-2), which have the potential to enhance healing, grafting and connective tissue repair. The specific attributes of these growth factors are not as important as the basic understanding that these growth factors can dramatically influence the way connective tissues heal and proliferate. The use of these growth factors to influence regulatory function for healing has sparked significant interest in orthopedics.¹



What are platelets capable of doing?

The growth factors derived from your platelets have been shown to promote the migration of small blood vessels into the tissue and pluripotent (autologous stem cells) into an area to promote the release of additional growth factors. This has been used for example to accomplish the following:

1. Stimulating articular chondrocyte proliferation and healing cartilage defects in joints^{2,3}
Thus is currently being used to influence proliferation of cartilage in arthritic joints.
2. Healing of chronic wounds^{4,6}
3. Enhancing healing and pain reduction in shoulder arthroscopic surgery^{7,8} Surgeons wanting to take advantage of the healing power of platelets are injecting platelet rich plasma into the shoulder after surgery to enhance healing.
4. Fibroblasts and collagen proliferation. Because I have been working with previous treatment methods utilized to proliferate connective tissue and heal tendons and ligaments, I became extremely interested in the potential of this treatment as another option for my chronic pain patients who suffer from tendon and ligamentous pathology. The use of a patient's platelets has now had become a powerful biologic tool for the orthopedic and musculoskeletal clinician to affect tissue healing^{9, 11}

WHAT EXACTLY IS PLATELET RICH PLASMA?

Platelet rich plasma is typically prepared by obtaining the patient's own blood via an IV. Their blood sample is then transferred into a special sterile bag and the cells are "fractionated" or separated into the various cells.

One of the most attractive parts of this treatment is that you are utilizing the patient's own blood. At no time is there any other individual's blood, blood elements or cells utilized during this process. This eliminates any worry or risk for spread of infectious disease such as hepatitis, HIV, et cetera. Utilizing the patient's own blood is the beauty of this therapy. Therefore, the only things being injected into your body are elements of your own blood! This represents one of the most natural therapies I have ever encountered.

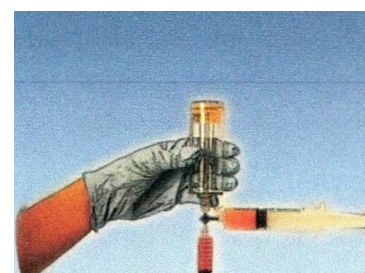
WHAT IS PLATELET RICH PLASMA USED FOR?

The use of platelet rich plasma injection for the purpose of wound healing and treatment of tendinopathy has become more commonplace in orthopedics and sports medicine.^{4,8-11,12-16}

This form of treatment has been shown to be highly effective in treating tendinitis/tendinopathy, which is what sparked my interest in this treatment. Now, tendinitis/tendinopathy is a rather complex subject. This method of treatment is not a panacea or cure for all joint and soft tissue pain syndromes. It is unfortunately far from that. However, in carefully selected individuals it is a powerful biologic tool. There is a subset of individuals who develop persistent pain despite well-accepted treatment methods. These individuals often have temporary relief with corticosteroid injections but unfortunately have recurrent pain. Mirisha et al. an orthopedic surgeon at Stanford University popularized this technique when he published a linear study on the effect of platelet rich plasma injection on chronic tendinosis for lateral epicondylitis (tennis elbow)¹⁷. He was able to demonstrate in patients who have failed conservative treatment (including injection treatment) at 81% success rate utilizing platelet rich plasma injection. Following his publication I personally begin to use this method of treatment more frequently and noted my success was much better than I had experienced with standard prolotherapy techniques in the past. Over the years I began to treat spine complaints including sacroiliac joints, cervical, thoracic and lumbar spine joints with relatively dramatic success. That is how I began to treat costovertebral joints as described in this article. I also frequently switch to PRP as a method of treatment when the patient reaches a symptomatic plateau with prolotherapy techniques.



Pure PRP®
Sample: 6 mL
Platelet Concentrations: 7-9 X Baseline
Platelet Yields: 80-98%
RBC Yields: 0%
Neutrophil Granulocyte Yields: 1% or 90%



HOW WAS PRP PREPARED?

I have used most of the commercial technologies available for making PRP. Each one of them has its advantages and disadvantages. Unfortunately not all of them provided a means to customize PRP in the manner in which we needed and so now we have our own stem cell lab and hematology lab that allows us to customize PRP. We take a sample of your blood and use a series of sequential centrifuge techniques to separate out your white blood cells, red blood cells, your platelets and plasma. Plasma is the fluid your blood cells circulated in. An anticoagulant is put in the blood to prevent it from clotting while we are preparing it in the lab. Once the platelets are separated they can be reconstituted or added back to a small amount of plasma and thus you have “platelet Rich plasma”. Because we are able to customize formulas, we can manipulate the platelet concentrations from 5 times normal to 20 times normal depending on the proliferation and what we are trying to accomplish.



SUMMARY:

In summary, the costotransverse joint syndrome is a relatively common source of chronic mid back pain that typically occurs between the shoulder blades either to one side or the other. It is often resistant to conservative treatment and requires injection therapy to improve or resolve the problem. Injection therapies can involve local anesthetics, and anti-inflammatory medications or sometimes more sophisticated ligament strengthening injections which can involve prolotherapy, platelet Rich plasma, extracellular matrix and scaffolding injections or on rare occasions, Stem cell injections. We have mastered the method of injecting these joints using ultrasound guidance. We find ultrasound to be the most effective image guided procedures for costotransverse joint injection because the lung, ribs, and target tissue can be identified easily on ultrasound much more readily than x-ray.

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