The Correlation Between Degenerative X-ray Findings & Functional Instability In The Lumbar Spine

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Spurs are a very common radiographic finding. They are associated with the degenerative process but often they can tell us more than that.

Most sources agree there are two basic types of anterior spurs, the claw and the traction spur. A claw spur looks exactly like it sounds, like a claw. It is triangular in shape and most importantly, it will curve over the discovertebral junction. The traction spur is typically a straight projection, 2mm or greater in length that does not cross the disc space.

There has been considerable discussion about why they are different shapes. While the results are not as black and white as all things x-ray should be—the data strongly suggests that traction spurs are an indicator of posterior translation instability and that claw spurs are an indicator of disc degeneration. There is also a third opinion which is that they are both parts of the same degenerative process.

Pitkanen et al studied instability using flexion-extension radiographs. They looked at plain film findings that are generally associated with instability. These included disc degeneration, spondylarthrosis or claw spurs, arthrosis of the facet joints, retrolisthesis, traction spur, spondylolisthetic spondylolisthesis, degenerative spondylolisthesis and vacuum phenomena. These all are findings that we commonly see and point out on the films while discussing the films with patients. Only four of these are indicative of instability. The two types of spondylolisthesis, spondylolisthetic and degenerative showed significant anterior sliding instability compared to all the other findings, still they were relatively small compared to the number found. Of the two types of spondylos, only 8% of the spondylolisthetic spondylos and 21% of the degenerative as found on flexion x-ray had any anterior instability. However, it does appear that normal flexion-extension films have limits to their ability to detect instability in spondylolisthesis.

Ora Friberg published her findings in 1989 in the *Annals of Medicine*, where she used dynamic traction-compression radiography and the patients were either hanging when x-rayed or were carrying 20-100 pounds on their shoulders to assess instability. She found instability ranging from 5 to 15 mm in approximately 50% of the patients with spondylolisthesis of L5 in which flexion-extension films had failed to produce any abnormal movement. These findings correlated significantly with the severity of back pain present, especially the maximal static slip.

Of all the radiographic findings that Pitkanen analyzed only the traction, and the claw spur had any significant correlation with posterior instability. The traction spur was more representative across the entire lumbar spine with frequency being most common at the L3 and L4 disc levels. The claw

spur was almost entirely relevant at the L5 disc level. Interestingly, disc degeneration provided relative stability to the segments.

Heggeness's 1998 review of the literature suggests that both the traction and claw spurs are different phases of the same degenerative process which is echoed throughout much of the literature. The thoughts have influenced many of the studies that have come after and that is repeated by Pate et al.

It is difficult to explain why this is not an all or nothing phenomenon. Why do some people with spurs have instability and others do not? Kasai et al attempted to study this and found that the osteophytes occurred most frequently at L3-L4 and also more frequently in men, obese patients or those with heavy physical activity. In my opinion, these findings are likely explained due to the increased load of the obese and male population due to their body weight and the increased mechanical stress created by subluxation combined with heavy physical activity. The misalignment aspect of the MOPI (Misalignment Occlusion Pressure and Interference) model would necessarily include abnormal biomechanics which would increase the mechanical stress involved with heavy physical activity. When this happens Wolff's law will remodel the bones to create the stability the body needs. This result is spurs. This thought is supported by Kasai's findings that the least likely segments to have a total bony fusion were L5 3.8% and L4 at 5.3%, the least movable segments in the lumbar spine.

While we are unable to account for the individual's personal variables such as genetics, diet, stress, adaptation and subluxation, it does appear that the increase in motion, normal and abnormal, tends to be a predisposing factor to spurring.

Deborah Pate, et al is in favor of the theory that claw and traction spurs are part of the same process. This paper had very interesting findings. First, following the appearance of traction spurs the disc can degenerate extremely quickly, going from a D1-D2 disc to a D5 disc in as little as two years. Second, traction spurs appeared more frequently in patients who had died between the ages of 50 and 59 years of age. Third, the traction spurs are more likely to appear on the superior end plate rather than the inferior end plate. Lastly, 75% of the spurs found between L3 and L5 were traction osteophytes.

So, what does all of this mean? My most important take-away is to redirect where my attention goes when looking at a film. When first in practice I would see a degenerated disc and think of all the work that needed to be done to stabilize it. My thought was that as the disc has thinned, the ligaments, having initially grown to be fitted for a thick disc, would be lax and there would be some degree of instability. Now I see this is not the case. The smaller traction spur is a predictor of posterior instability, meaning that the vertebra is prone to retrolisthesis, the "P" of the subluxation. It is the first and best radiographic indicator we have for the biomechanical part of the subluxation being present. We see evidence of a spine going from traction spur to having an extremely thin disc with bony changes, including spurs, within two years. While there is no way for us to account for the

other factors, i.e. biomechanical stress, dietary stress, etc., it is possible and far faster than we generally believe it to be.

That traction spurs are more common in people who die between the ages of 50-59 years indicates that there is some physiological malfunction present which leads to the rapid formation of them. Whether this is completely lifestyle related, just subluxation or a combination of the two we don't know. But it does impress upon us the importance of evaluating those relatively small findings much more seriously.

It seems the natural progression of the degenerative process would be some type of temporary dysfunction, followed by an instability and then stabilization. The first phase could be a sprain or a subluxation, as a result of a failure to adapt to any environmental stress. That progresses into a phase of instability and abnormal mechanical stress which would result in the traction spur. Lastly stabilization is achieved through claw spurs and disc degeneration as the body tries to minimize potential damage. What is unclear is why some discs degenerate much more quickly than others and why some degenerated discs have no claw spurs.

This is where your autonomy as a doctor comes into play. When you see an individual with traction spurs and little or no disc degeneration, you can decide to take flexion-extension films. You can even use a weighted vest and shoot a separate lateral lumbar view of spondylolisthetic patients to see if they really do have the instability as Friberg's work found.

You must always remember that the patient in front of you chose *you* to provide their care. You must use every tool available to locate the subluxation and do your best to correct it. What you learned by reading the chapters gives you the framework, but it is not everything you have at your disposal.

Hopefully these insights help us all see beyond the black and white of our standard AP and lateral full spine films, get a better understanding of what is functionally occurring in our patients' bodies and better correct the subluxation.

With all the increased criticism of our use of x-ray lately, it is even more important that we get the most out of our films. This will help us not only provide the best care possible, but through our results, it will also show the rest of the profession why taking films is so important.

References:

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