Lumbosacral transitional vertebrae in the German Shepherd Dog

by Mike Guilliard MA VetMB CertSAO MRCVS

What is a transitional vertebra?

The spinal column is composed of individual vertebra through which runs the spinal cord and spinal nerves. Each vertebra comprises of a large cylindrical body the top of which is a tube through which the spine runs. The vertebral bodies are attached to each other by intervertebral discs that act as shock absorbers and by facet joints that allow movement. There are also large bony protrusions or processes to which the muscles are attached, the dorsal spinous processes can be felt in the midline of the back (humans and dogs) while the lateral processes in the chest have developed to become the ribs.

The spinal column is divided into segments and these are the neck or cervical spine, the chest or thoracic spine, the lumbar spine and the sacrum that forms part of the pelvis. Each segment has characteristically shaped vertebrae. A transitional vertebra is one that lies at the junction of two of the segments and tries to take on the shape of the vertebra of both segments. A transitional vertebra at the junction between the chest and the lumbar spine may have a vestigial rib. However it is at the lumbosacral junction that transitional vertebrae occur commonly, especially in German Shepherds, and they often have clinical consequences.

The sacrum comprises of three vertebrae that have fused together and therefore lack intervertebral discs. The head end articulates with the seventh lumbar vertebra and the tail end with the first caudal (tail) vertebra. The sacrum is attached to the ilia (pelvis) by the sacroiliac joints on its lateral aspects and it is through these joints that forward thrust from the hind limbs is transmitted to the body of the dog. A transitional vertebra at the level of the first sacral vertebra takes on some of the characteristics of a lumbar vertebra in that there is a vestigial disc space between the first and second sacral vertebrae and there can also be an abnormal lateral process with abnormal attachments to the ilia (pelvis). This deformity may be either symmetrical or asymmetrical and can result in a tilted pelvis.

Clinical consequences

There are two separate clinical conditions that can occur as a consequence of having a lumbosacral transitional vertebra.

1. Unilateral hip dysplasia
   This results from the pelvis being tilted along its long axis there by decreasing the coverage of the femoral head by the acetabulum on one side and increasing it on the other. The former tends to destabilise the hip causing it to move in and out of its socket initiating inflammation and ultimately osteoarthritis.

A marked difference in scores between the two hips can occur naturally without a spinal abnormality but most commonly it is due to uneven positioning of the dog during the x-ray procedure. This should be recognised by the radiographer and the appropriate adjustments made to the positioning.

2. Lumbosacral stenosis (cauda equine syndrome)
This is seen in the middle aged to old dog. The cauda equina is the name given to the spinal nerves that run from the end of the spinal cord in the mid lumbar region, along the spinal canal into the tail. Segmental pairs of spinal nerves leave the spinal canal between each vertebra above the intervertebral disc.

Lumbosacral stenosis is a compression of the spinal canal from a prolapsed intervertebral disc usually with thickening of the soft support tissues, leading to nerve impingement with pain and occasionally interference with hind limb movement. Clinically the dog with low back pain is reluctant to run and especially jump or climb stairs.

X-rays show a bony bridge between the last lumbar vertebra and the sacrum. This is called spondylosis but it is an extremely common finding in the older dog with no clinical signs. A more definitive diagnosis can be made by MRI that images the soft tissues as well as the bones. Most of these dogs will settle down with conservative management but some require decompressive surgery.

A lumbosacral transitional vertebra predisposes the dog to a lumbosacral stenosis by altering the biomechanics of the spinal column placing abnormal stresses across that area.

What is the incidence of lumbosacral transitional vertebrae

The association between lumbosacral stenosis and lumbosacral transitional vertebrae has been investigated in 4000 control dogs (1). The overall incidence of lumbosacral transitional vertebrae was 3.5%, while in 92 dogs with lumbosacral stenosis the incidence was 16.3%. Therefore dogs with lumbosacral transitional vertebrae are eight times more likely to develop lumbosacral stenosis than dogs without the anomaly. This report also states that German Shepherd dogs are eight times more likely to develop lumbosacral stenosis than other breeds.

In another publication of a study of 143 dogs with lumbosacral transitional vertebrae, the German Shepherd dog was greatly overrepresented (2).

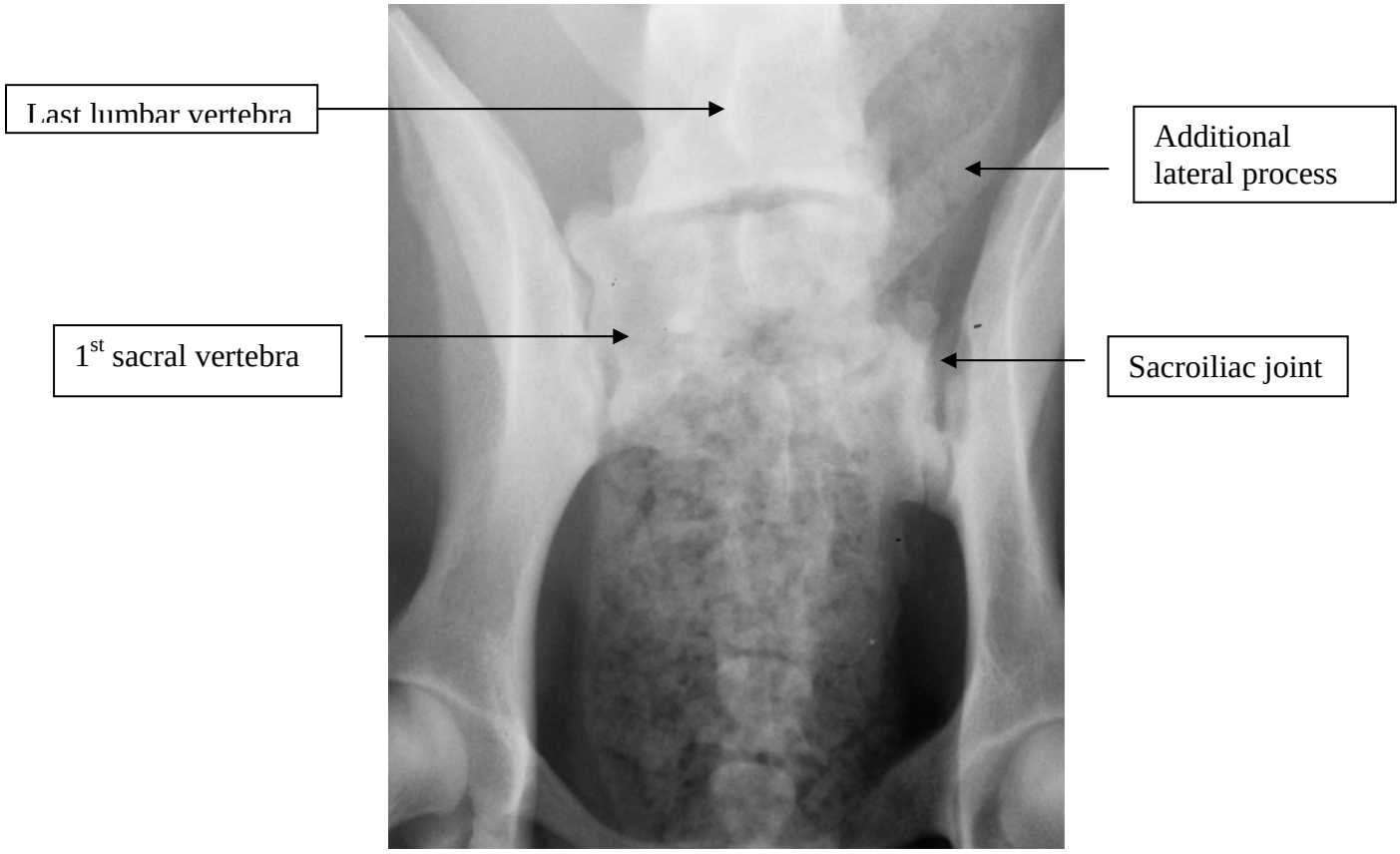
What can be done to reduce the incidence

Lumbosacral transitional vertebrae are readily identified on x-rays of the pelvis in both the standard hip extended view used for hip dysplasia schemes and the lateral view. The condition is considered to be genetic but a reference to the heritability has not been found.

Therefore it would be very simple to screen for the anomaly at the same time, using the same x-ray plate, as screening for hip dysplasia. Then perhaps the incidence of lumbosacral transitional vertebrae may begin to decrease.

References

1. Fluckiger and others (2006). A lumbosacral transitional vertebra in the dog predisposes to cauda equine syndrome. Vet Radio Ultrasound. 2006 Jan-Feb; 47(1):39-44
2. Morgan JP (1999). Transitional lumbosacral vertebral anomaly in the dog: a radiographic study. J Small Anim Pract. 1999 Apr;40(4):167-172



An extreme example of a transitional lumbosacral vertebra. Note the marked asymmetry.