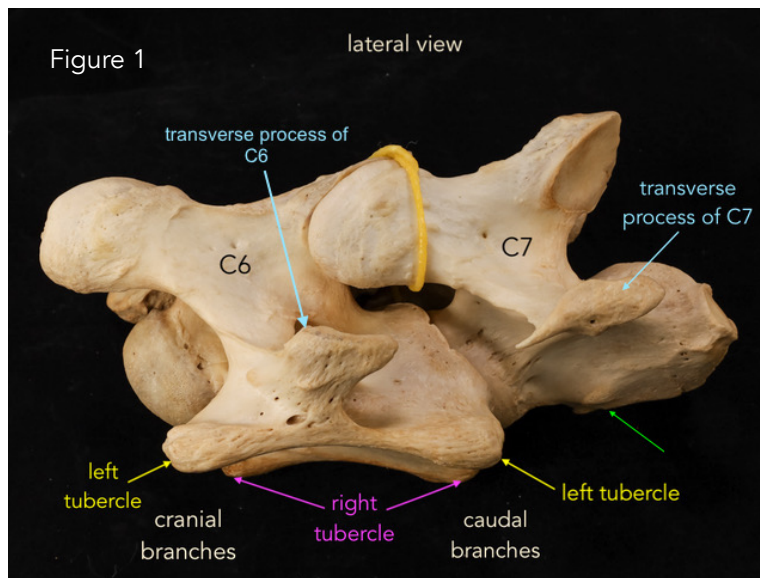


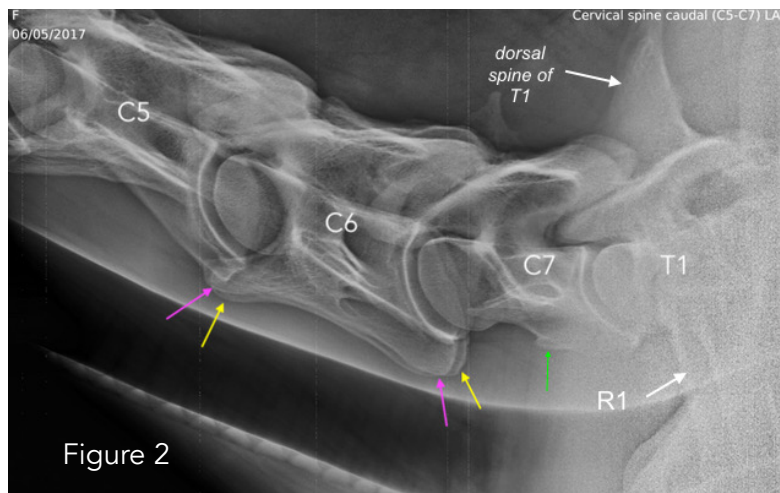
**Key features of normal morphology for C6 and C7**

C6 is the ONLY cervical vertebra with tubular bony processes on the ventral surface (underside). These extend the full length of the vertebral body on the left and right sides (yellow and pink arrows). They are often referred to as *ventral processes*, *ventral tubercles* or *ventral laminae*. Click on this [link](#) to view a 3D scan of a normal C6. (Use mouse or finger to move it around).

For descriptive purposes, the portion of the ventral tubercle that is cranial to the transverse process is called the "*cranial ventral tubercle (CrVT on the 3D models)*" or as shown here, the "*cranial branch*" (cranial = towards the head). The portion of the tubercle that is caudal to the transverse process is called the "*caudal ventral tubercle (CVT)*", or "*caudal branch*" (caudal = towards the tail). Also note the ventral surface of normal C7 is relatively smooth with the exception of a pair of short, low profile tubercles present along the midline (green arrow). Click [here](#) to view C7 in 3D.



In the lateral X-ray of normal C6, C7 and 1st rib below, note the different VENTRAL morphologies of C5 (no ventral tubercles) relative to C6 (has ventral tubercles). This is what to look for in the X-rays, with exceptions that are explained below. This X-ray also shows the first thoracic vertebra (T1), the 1st rib, (R1) and the dorsal spine of T1 which is a good sign-post.

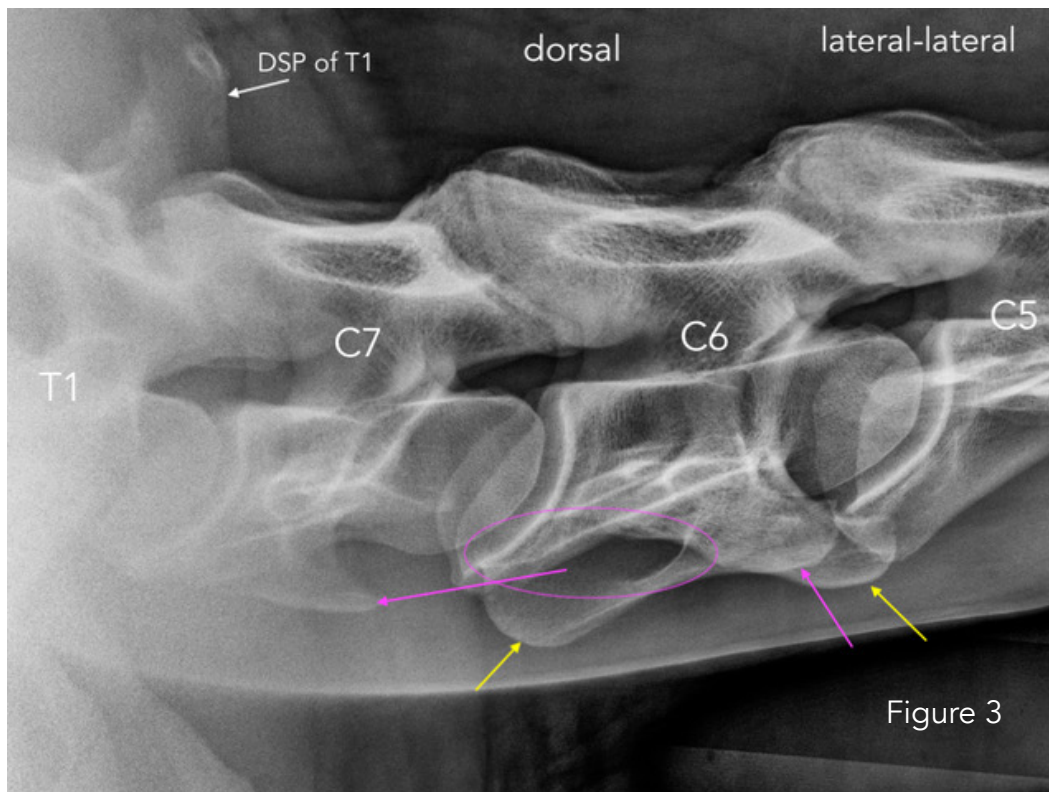


## **ECVM Morphologies of C6 and C7 (most common)**

The varying malformations of C6 that constitute ECVM involve the CAUDAL branches of the ventral tubercle wherein, **either left, right, or both** will be partially or totally missing (aCVT). The amount of bone missing can vary between horses and in the bilateral condition, right and left sides can have differing morphologies within the same individual. (Click [here](#) to view 3D scans of several C6 variations).

When one caudal ventral tubercle is missing from C6, a similar structure often (but not always) may develop (abnormally) on the ipsilateral ventral surface of C7. This is commonly referred to as a **transposition**.

As with C6, the transposition(s) on C7 can be left or right unilateral, or bilateral and can be of varying sizes. Click [here](#) to view a 3D C7 with unilateral transposition. In some X-rays it can resemble a shark's fin, as below (left pink arrow).

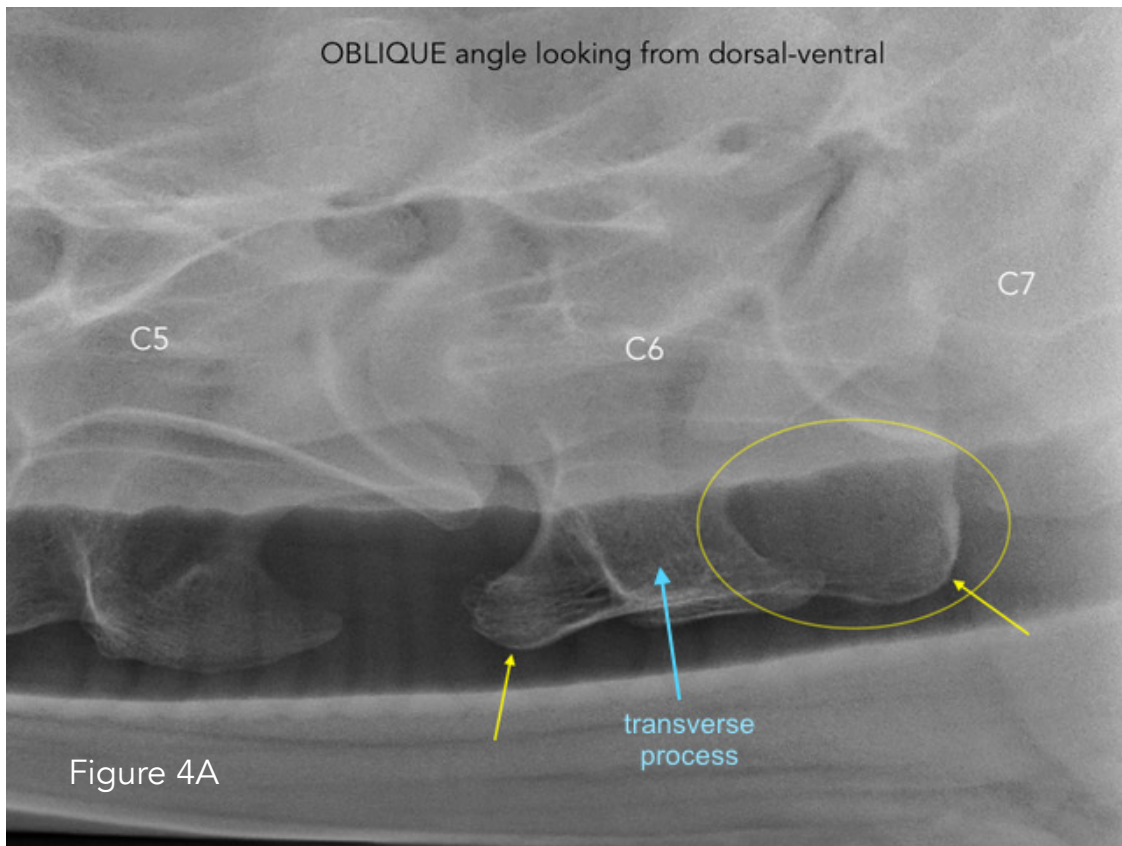


Note in the X-ray above that one ventral tubercle is normal on C6 (yellow arrows). This can make assessing the morphology of **both** sides difficult in the lateral X-ray views. In the example above, if C7 did not have the transposition on C7 (left pink arrow), then one might think C6 was normal on both sides, except in this case, it is only the right side that is normal. Thus, the reason why **both left and right sides should be radiographed**.

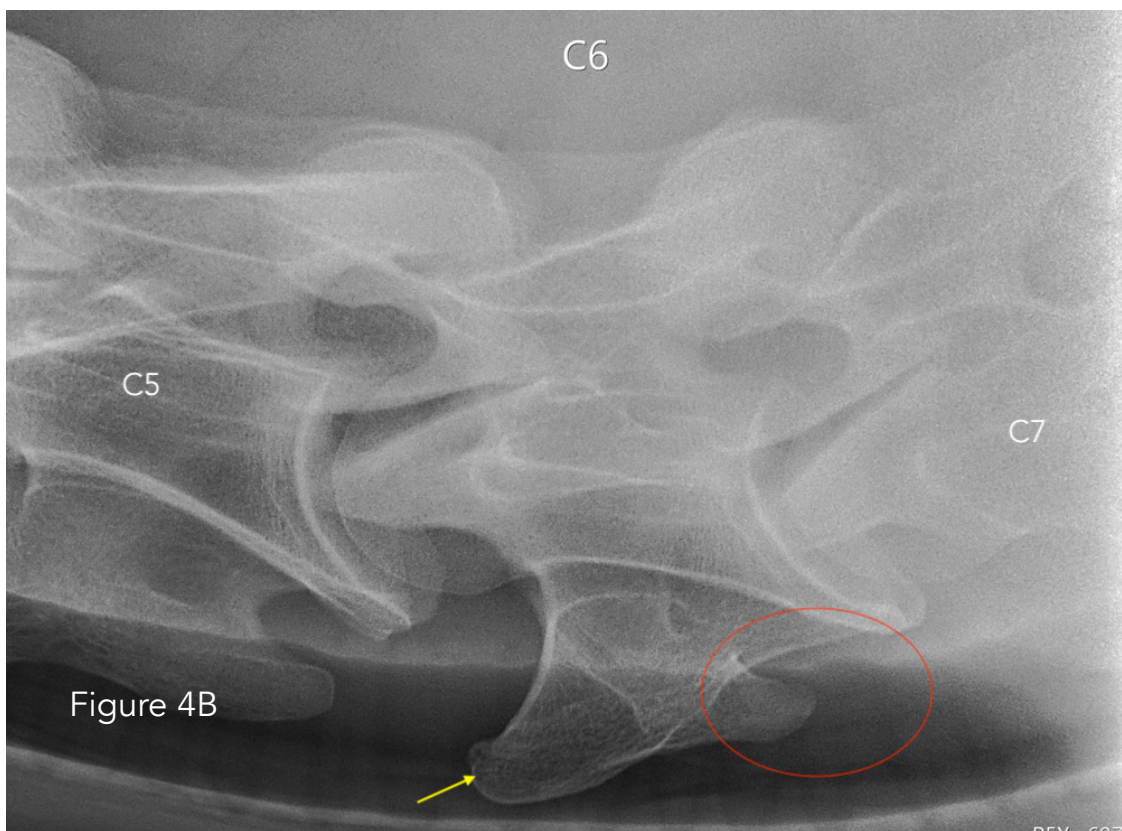
Many times, even with left and right lateral views, it may still be challenging to ascertain the condition of both caudal ventral tubercles. This is when **left and right oblique** views will help clarify because they show the condition of only one ventral caudal tubercle in the frame.

The 2 X-rays below illustrate dorsal-ventral oblique views. A) a normal C6 where the left yellow arrow points to the cranial branch and the right yellow arrow and oval outline the normal sized caudal branch. B) a unilateral C6 with the caudal ventral tubercle missing (red oval.)

A)



B)

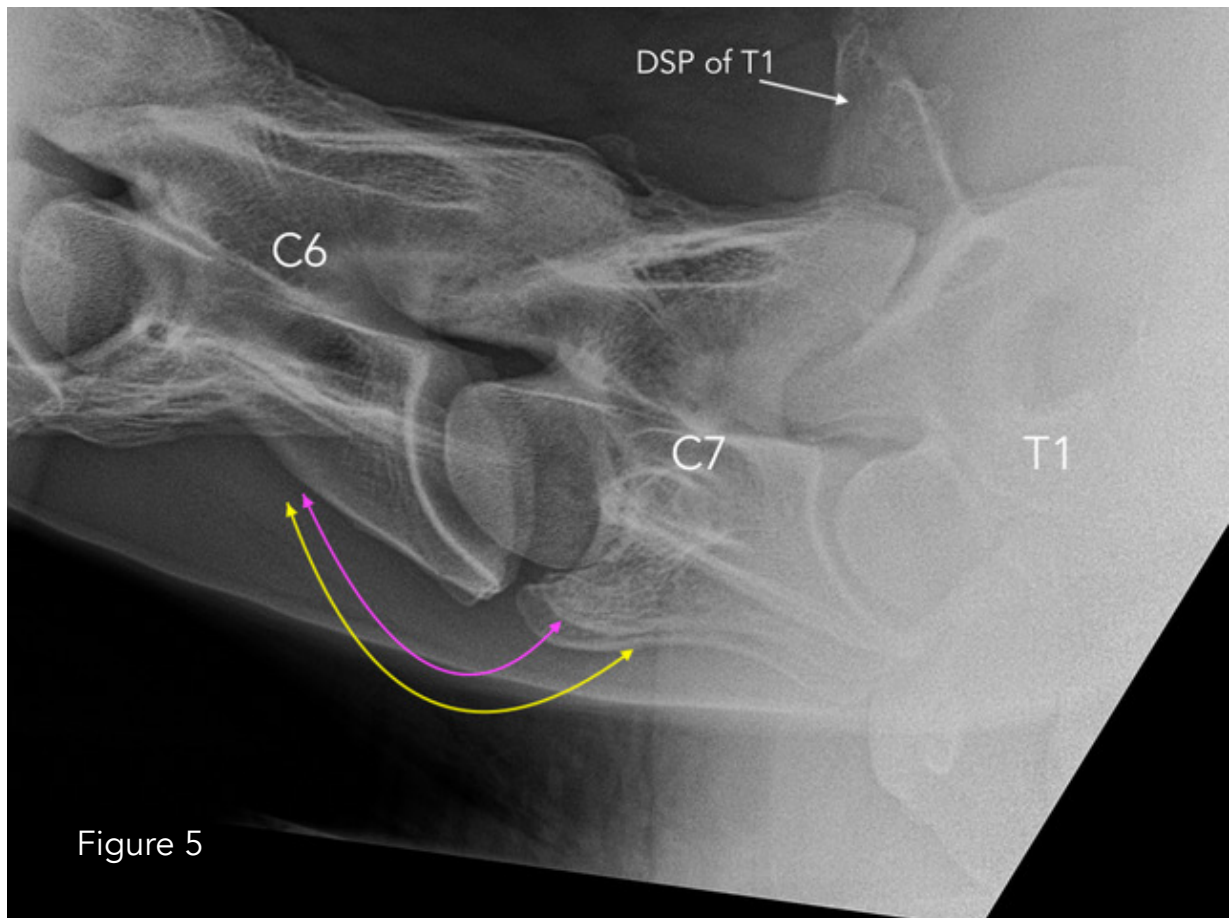


**\*\*NOTE:** the X-rays above are oblique views taken from *dorsal to ventral* as per the 2020 ECVM X-ray protocol published by Christine Gee, DVM that places the trachea in the background. A more recent protocol by Ros et al., 2024 recommends *ventral to dorsal* obliques as this can often get better resolution behind the shoulder joint.

Now the **tricky part** ... in nearly half of the ECVM horses in our study and in other reports, C6 is missing BOTH caudal ventral tubercles (bilateral) and in some of these, C7 has developed two transpositions on the ventral surface. As with C6, there are often asymmetries in the sizes of the transpositions between left and right.

More importantly, when the caudal ventral tubercles are missing from both sides of **C6** it **now looks like C5**; and when transpositions are fully developed on both sides of **C7**, it **now looks like C6**.

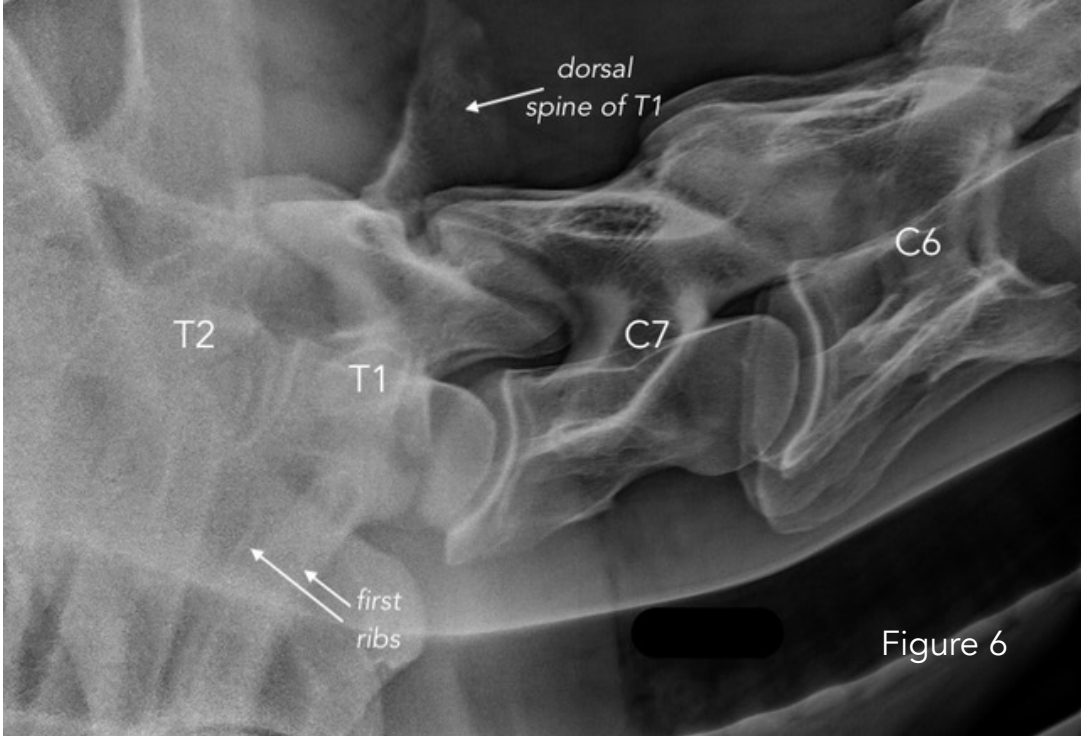
This can fool the viewer of the radiographs into thinking that C6 is normal. One key to knowing which vertebra is the true C6, is to look for the dorsal spine (DSP) of T1 as in the X-ray below.



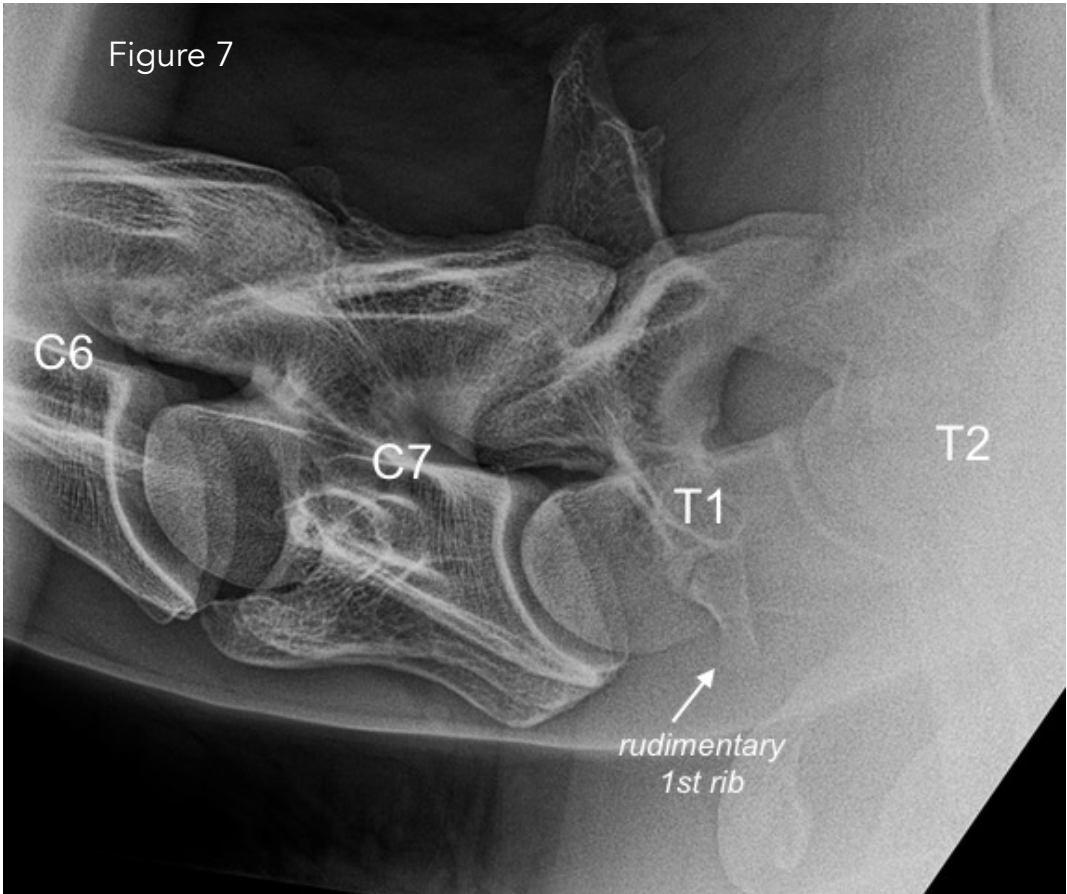
Finally, we previously thought that malformation of the 1st and sometimes 2nd sternal ribs only occurs when C6 is malformed (see May-Davis 2017). We (and our European colleagues) are now finding **rudimentary or otherwise malformed 1st ribs in some horses with normal C6 morphology**.

Therefore, it is **equally important to X-ray as far as T2 and assess the ribs even if all looks well at C6**, especially if the horse is exhibiting signs of girthing, stumbling, biting at the upper front limbs or shoulders, sensitivity in the withers, resistance to moving forward (rearing), and random, unexpected bolting.

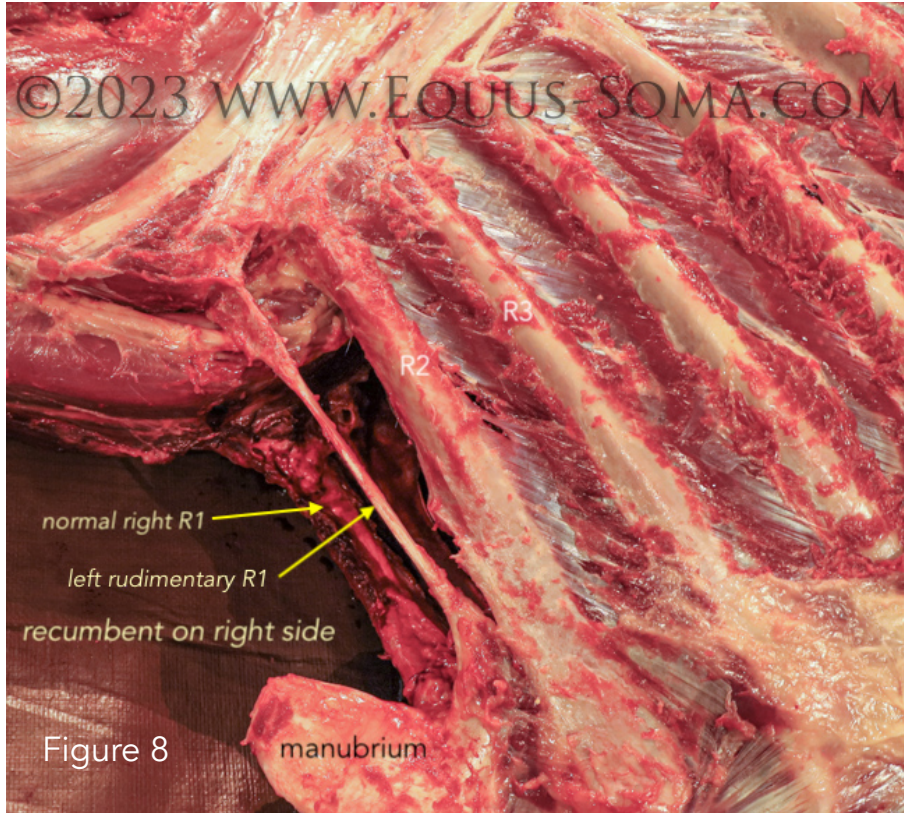
Below is a view of normal C6, C7 and 1st ribs (upper half):



Below shows that the 1st rib on this side is a mere stub (rudiment) articulating with T1.



In dissection, we find either a thin cartilaginous extension (below) or a thin, flimsy ligament replacing the osseous shaft of the 1st rib. The same was reported and illustrated in this 1901 [publication](#).



After removing the left rudimentary rib from the above, and simmering to remove the soft tissue:



**PLEASE SHARE THIS PRIMER WITH YOUR VETERINARIAN**

## References:

ECVM references (PDFs) can be found here (scroll down the page): [www.equus-soma.com/references/](http://www.equus-soma.com/references/).

May-Davis et al. 2023.

<https://www.equus-soma.com/ecvm-bones/>

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***Disclaimer:** I am not a licensed veterinarian and am not making claims to diagnose, treat or cure. The information provided here with respect to ECVM is based on my experience viewing hundreds of radiographs and studying the actual bones while conducting research on the morphologies that comprise ECVM. My comments should not be considered a formal diagnosis. The observed symptoms presented by ECVM horses can often mimic other physical issues and only your veterinarian is legally allowed to make those diagnoses.*