CANINE SHOULDERS

by Sue McClure

I'm often asked to explain my view on shoulders. It is easier to explain when I have the bones with me to demonstrate, but much harder to illustrate on paper. While many have a good understanding of what is involved, many don't, so please bear with me, as I try to get from point A to point B, in an attempt to illustrate as completely as I can.

Jill Bregy feels for the tops of the blades on '96 IWCA Veteran Dog, Ch. Shamrocks Mar Liath of Legacy, shown here by the author and co-owner, Sue McClure

The shoulder assembly is a complex interaction of bone, muscle, connective tissue, including tendons and ligaments. It all has to come together for the dog to have optimum front end movement, thought by many, including myself, to be the easiest to lose and the hardest to get back in breeding. There is no one answer to what makes it work. The musculature is very complex and interactive, involving the spine, trunk and the shoulder assembly. Here, I will try to demonstrate how the skeletal configuration plays a part and why some things can and can't happen.

Many old books & writings refer to the shoulder of the dog as being, if proper, at a 45 degree angle of layback. Lately more and more knowledgeable folks concur that this was erroneous, based on horsemen's observations, and not actual anatomy studies. We know that the horse and dog have different skeletal structure and movement, as well as purpose and size constraints. But there are still many who call for a 45 degree layback of the dog's shoulder. I got one picture of my dog sent to me by someone trying to learn, with 90 degree angles super-imposed over him, asking if that wasn't a correct assessment. Not only is this particular dog very moderately angulated, but in that particular picture he was young, and young IW's are straighter in angulation than they will be as adults. It was in trying to explain how it works to him, that I moved to put this together, and I share it for others, who maybe interested.

Front right scapula-humeral joint, slightly lifted on the left and fitting together in its best seated position on the right. Note: while the back of the humeral ball broadens, the front has a groove, into which the scapular tuberosity fits. This limits lateral and forward movement.

What I have learned over the years is due to many mentors in the dog world. We owe all of them a debt of gratitude for their studies and willingness to teach. The most informative seminar I've attended on structure featured Bonnie Dalzell, who was a writer for the Windhound magazine before I contacted her about joining our panel, which included Connie Miller, with her take on the history of the dog. Bonnie brought bones and stop action videos that made her explanations so simple to understand, that I began collecting and studying bones myself, and for this illustration I use the skeletal remains of a 32 inch high, 7.5 year old wolfhound. The joint capsule, which keeps the joint lubricated and from grinding bone to bone is missing of course, and does have a part to play that is not illustrated here.

The first thing to understand is how the blade and the humerus fit together and move. It doesn't look like a straight, by the book, ball joint that has radial movement as does our own shoulder. The canine doesn't have a clavicle, as do humans and birds that allows for the wider range of motion to the side. (It is helpful to envision yourself in a kneeling position corresponding to the dog on all fours. Because of your clavicle, you can not only move your arm forward and back, but you can raise it laterally, where the dog cannot.) The humerus has a good sized head on it, and when you fit the scapula to it, you can see a groove that controls forward movement, but there is room for some play toward the back of the "ball" when the humerus is drawn back.

Rear inside fit of the seated scapula-humeral joint

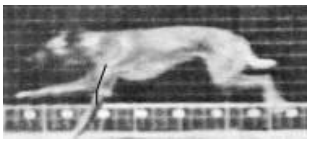
When you hold the two bones together (and the humerus is slightly longer than the scapula on sight hounds) in a position to where they are well seated, you do not get a 90 degree angle. In fact, at right angles, it is very apparent this would not be stable, when you add weight. Do understand that the musculature and ligaments are what ultimately hold the bones and joints in place. As noted, angulation in younger dogs is straighter than in older dogs. Young muscles and connective tissue are tight. As

Shoulder bones of a small IW on the left, while the blade of a mixed lab are on right. There's more than just size differences, for instance the lab has a broader flare and blade in comparison to size.

the dog ages, usage and weight, as well as exercise, or lack of it, play on the strength and flexibility of the organs and tissues that not only hold it together, but have an effect on the growth of the skeleton.

We might think the dog has a straight line formed from toe to top of the scapula, when in full extension, but as demonstrated in this picture of a borzoi in full stretch, this isn't so. The structure of the joint won't allow it. The blade itself isn't connected to the spine and has room to slide back and forth with the joint as a moveable fulcrum, so that gives us a little more forward lift of the forelimb than just the joint alone, but in fact, the joint itself is limiting. (Because the shoulder isn't connected to the spine, muscles not only play a part in movement, but containment as well, however, I leave musculature for another author) First, let's examine real dogs in motion to see what I am talking about.

This borzoi is in the leaping phase of the suspension gallop, and is stretching her leading foreleg in preparation to land on it. The muscles have angled the blade backward, assisting in the lift and forward thrust of the humerus and foreleg.



At touchdown, this greyhound shows nearly as straight an angle as we are going to get. Please note where the dog is touching down in comparison to his head. This is pretty much where he would touch down at the trot. Even though the angle is more open at the run, the IW below touches down at nearly the same position in a trot

The dog on the left is on a different lead, but he has touched down with his left foreleg and you can see the give in the joints that accommodate the force of the landing. Imagine what a jarring the shoulder would take if the joint was at 180 degrees! Here angulation is playing more of a part in keeping the dog's joints from breaking down...it is not serving to move the dog forward. This is a very important observation. The dog is moving forward due to his momentum from the leap. This phase actually slows the dog down.

The general consensus is that reach equates to better movement, so why is the running dog not landing farther out? Because physics dictates that it doesn't need to. The dog is landing from a forward leap. The leg is keeping him from falling too far forward & downward, necessitating greater recovery time before he can again accelerate. The front leg is not going to contribute to moving the dog forward until his body weight is over the leg and he can begin to push off. Until that leg comes under the center of gravity, it is not moving the dog forward. If we understand that, then we can take another look at the shoulder angulation.

Photo Courtesy of ASFA

There are two things to observe in this ASFA pictured (left), as compared to the one on the right. First, where the rear legs are touching down, just behind the dog's keel and also, see how quickly the elbows have been drawn up from a very open angle as the dog pushed off into the suspension phase. This probably contributes to the lift the rear legs are about to give the body when they push it upward and forward into the leaping phase. (Try a broad jump with your arms at your sides, and again using your arms to help the forward & upward movement)

This dog is just pushing off his front leg and his rear legs are thrust as far forward as he can get them, with the aid of his flexible back. The arrow line is the area where his front leg is able to push the body forward. His forward motion is going to cause the rear feet to land close the mid-body line. As they are already under the dog's weight they push off sooner.

There is no interference between rear legs and forelegs, as the rear legs come around the front legs. This makes it important not to be front heavy or too broad across the shoulder in comparison to the pelvic girdle. The legs spread outward at the stifle or knee joint to accommodate, but lets not go against the mechanics involved.

You may have noticed, where I marked the line of the shoulder's angles in pictures, I did not draw the line to the elbow, which is where the eye wants to take us. The elbow is actually part of the ulna that hooks into

foramen in the distal end of the humerus.

This is how the humerus and scapula fit when seated well

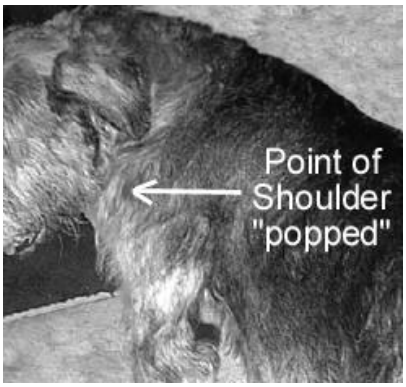
I can actually balance the scapula in this position, if I tilt the assembly, but not if I place it in a more closed, 45 degree angle.

<-- The ulna has a curved area that hooks into the foramen of the humerus (see the out take)

Lines superimposed over the loosely held bones show the points our eyes use as reference when we look at the dog's front. The picture on the right shows how the hinge joint of the elbow works when the leg is lifted.

If we try to place the scapula where it forms a 90 degree angle, it rides on the back ball of the humerus, and would not be a stable joint. And how would it contribute to moving the dog efficiently? Theoretically, a more closed angle allows for more reach. We have already seen that forward reach is not as important as rearward thrust. Again, using your own body to demonstrate, hold your arm out laterally so your humerus is level with your shoulder and the forearm is pointed at the ground, forming a 90 degree angle between the upper and lower arm. The center of gravity for the strength of that fulcrum (joint) is right under your hand, in a straight line down from the elbow, so let's consider that is where the ground is for this experiment. If you straighten your arm so your hand is level with your shoulder, what part of the arc made by your hand would be on the ground? Consider that when the leg goes forward, the dog is in a leaping phase. Now bend the lower arm in toward you. Consider that the dog would now be in the falling forward stage, and as the weight moves forward at touchdown, the weight is moving over the point of touch down, so lean into the area where your arm is as you draw the lower arm back. It is spending more time on the ground and has more to push against as it comes through the backward arc. Now open the angle of your arm, which involves dropping your arm some and straightening your elbow somewhat. If you are on your knees, you find that you can bear more weight on the elbow joint than you could at 90 degrees, a plus. Now repeat the above experiment. The more open angle does not impede touchdown, and you have more arc behind the center of gravity.

Below is a dog that appears quite angulated, with a very deep chest. In reality, the short neck belies part of the problem. The dog's elbows are well under this dog, but the tips of the blades are above the level of the spine, higher in the neck than they appear. One indicator of loose connective tissue is in the flipping of the pads. I'm told that another is, that the dog's trunk is slung lower, giving him more apparent depth of chest, but his blades ride higher. As the dog aged, the instability of the shoulder became more evident, but this dog moves his legs in the correct planes. It's when he stands that he can "pop" his shoulder out. I use him to illustrate, not that angulation is bad, but that over angulation in the shoulder of heavy dogs can lead to problems, and that not all causes of angulation are sound, so it is important to understand the basic anatomy of the shoulder, and not just look for more angles. This is also a good illustration of how age loosens the muscles and ligaments. Although front heavy and long, this was not an unattractive youngster, but his structure couldn't hold up. Exercise could have helped him develop and could help tighten him up now at the age of 6.



While the dog on left is considerably larger than the one whose skeleton I use, placing the bones against the dog, might help one to visualize where they are in relation to the dogs body. The point of the shoulder is generally in line with the breast bone and the line of cartilage along the ribs. On the right I have superimposed the bones over a nicely angulated IW. They weren't shot at quite the same angle as the dog is standing, but it is a good indicator of placement in a dog that has as much angulation as one would need in a sight hound. Curtis Brown suggests that the sight hound doesn't need as much angulation in the shoulder as in the rear. I recommend his book on locomotion for an in-depth analysis of movement.

I end with a photo of Ch. Suntiger No Greater Love, displaying some of the many muscles involved in a truly functional sight hound front.

http://www.thedogplace.org/BREEDS/Irish-Wolfhound/Canine-Shoulder_McClure-1202.asp