Andrew Knight D.O.
OSTEOPATHY

Coombedene
Combe Hill
Keinton Mandeville
Somerton TA11 7AU
01458 223300
osteopath@andrew-knight.co.uk

"Ballands" series of articles for Field Archery Stance

1 - How Do I Stop The String Hitting My Nose?

This was the question I asked of a number of senior club members during July and August this year [2010]. It had just started happening and coincided with making the step from aluminium arrows to carbons. The initial tuning had gone well but I had developed the tell tale blood mark on the side of my nose.

As may be expected, the more opinions you ask for the more you get, so I went through tipping my head back, anchoring differently, tipping my head down and even shutting an eye; one at a time, in spite of many offering the view that shutting both eyes might improve my aim!

The one opinion that seemed to work was "turn your head more" which I found difficult even though I spend much of my day improving the motion of people's necks, but it worked and forced me to stand straighter.

So it was down to my stance. I was standing badly; I was reaching for the string with my head. This must be inefficient in terms of posture, energy use and will introduce variation and muscular tension, the excess use of energy would tire me out whilst shooting. The fatigue of muscle over use is not always due to poor fitness in the relevant muscles but can be an attempt to use them incorrectly.

Perfect Posture is good to aspire to and many people think they have an idea of what it should be. For my purposes here I am defining it as "that posture that uses the least energy to maintain."

The actual stance can vary given a variety of circumstances, depending on where you are and what you are intending to do. Fig 1 shows an archer at full draw in what is accepted to be a good posture for shooting, as it uses the least energy to accomplish a shot. Of course, in a field shoot it would be rare to stand like this, so this fig becomes the best posture for a target archer and the stance is discussed very well in Ray Axford's book "Archery Anatomy".

Returning to the principle that the best posture is that which cost us the least energy this figure shows a spine arranged vertically with the weight borne equally by the legs the head is up with the eye axis parallel to the level ground as is the line of the shoulder blades. The feet are at about the same distance apart as the hips.

The primary power groups of muscles for shooting are used to draw the bow. The tension of the drawn bow is held against the Serratus Anterior muscle from the underside of the shoulder blade which wraps around the chest wall, on the bow arm and against the Rhomboid group of muscles on the spinal border of the shoulder blade, the triceps in the upper arm and the long flexors of the fingers in the forearm.

The muscles of posture are a different set and more extensive than these power muscles. The efficient use of the posture muscles will hold the legs and torso in a position to allow for the shot to be efficiently taken and that balance can be maintained with the most minimal muscle use.

The spine should remain vertical so the posture muscles can balance the bones and not to hold the bones against the action of gravity thus inducing stress tension and fatigue. The vertical spine allows ease of use and even use of the power muscle set required to affect the shot and to maintain a consistent draw. The eyes should remain horizontal to allow triangulation for accurate distance perception. Thus major terrain variations are most efficiently compensated for with the legs.

Over the next few issues I hope to discuss in more detail the various issues of posture mentioned here where it relates to Field Archery and pass on some suggestions to try in practices “down the woods”.

Oh, and turning the head really does stop the string hitting your nose!

2 - What Was That Bloke On About?

In the expectation that you read my article in the last newsletter [a vain hope?] and had the above question in mind by the end of it here is some more mud to stir into this clarity!

The posture for an archer whether a target archer or a field archer is made up of 3 parts.

The Foundation Unit the stable foundation upon which function can take place. The pelvis and legs form a stable base upon which the power unit and the aiming unit can work .

The Power Unit all of the muscles used to draw the bow are in the torso. The bow arm is used in compression and the string arm in traction. “Recruiting” in muscle terms is the onset of use of secondary or accessory muscles to the action required. This occurs when the main muscles are too low in strength or the direction of action is imperfect for the action of the muscle.

The Aiming Unit the special senses, not just the eyes but the awareness of the atmosphere, make subtle adjustments, distance perception, the position of the head in relation to the power unit.

Each of these must work at the optimum for that archer in order to be efficient.

The principle I presented in the last article was of the least cost in energy being the most efficient posture. In the power unit the spine is arranged in a vertical column without forward / backward / left / right lean this removes the need of the muscles to hold against gravity. Any continuous contraction drains supplies in the muscle tissue the longer it is held. The more perfect the posture the greater the tendency toward balancing of the spinal bones in the anatomical line is achieved. Here an intermittent but frequent minimal contraction and relaxation is all that is required. This does not use up supplies in the muscle and requires only minimal energy use to maintain.

Of course this is easy if you are a target archer; you will stand the required distance from the boss and shoot at it. All the literature and articles I have seen are designed with level ground in mind and as such will apply themselves naturally to the target style, this is not true in field archery.

By watching archers of long experience prepare themselves for a shot I have noted that in common they all do the following:

Foot position, leg position, posture and head position, prepare the bow, shoulder position, calm the mind, look at the target, judge distance, draw the bow, aim and adjust, loose the shot, wait for the impact, return to the prepare the bow stage. In some cases this includes - look at the target, lean a little closer to the target but don't move their feet [quite why they do this when the boss is at 70 metres I don't know yet], squint, huff, swear, talk to their friend, laugh; return to the posture and head position and begin the next shot. Some go right back to the beginning.

The primary area of energy usage is in the power unit and as such the efficiency of this plays a critical role in

how tired one becomes at the latter stages of a shoot. For this area to work efficiently the foundation must act to allow this efficient position. Once this is achieved the aiming unit will easily accomplish its role and the shot will be made.

In the next article I will talk about centring and the use of breath, and how this is applied to getting round that tree or up or down that slope.

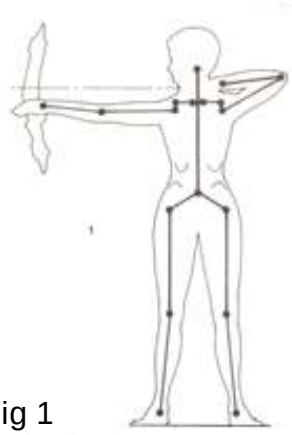


Fig 1

3 - The Centre

The “centre” is the optimum posture - but how do we know where it is?

Figure 1 shows an archer with the main structural lines that we try to achieve, it adheres to the posture information previously given in that the weight is into both legs and distributed evenly; the spine is vertical and the compression / traction through the upper limbs is lined up.

For some this is difficult to sense. A good way of learning to become “body aware” to sense this line up in ourselves is to draw a bow with the eyes shut (best to do this with a lookout person with you if you fit an arrow to the string).

Head centring is critical to judging distance. This is true in all situations and not just for shooting. The more we rely on accurate distance evaluation the more critical the horizontal eye line is. Your body will automatically sort this out for you as it is a core function of stereoscopic vision.

To try this out stand with the feet at shoulder distance apart [why this is the best stance is dealt with in another issue] with the weight evenly distributed between both feet. The vertical line from the tip of the nose to the ground [through the navel] should hit a point of equal distance and between the feet.

Now try this with the eyes closed and sense where this line is. This is your “Centre” and the core position to shoot from.

Draw your bow as you would to shoot; the precise method of draw is personal and depends on which coaching method you follow or favour.

Concentrate on the stresses on the limbs and in the torso when at draw, sense where te line from nose to ground is. Are you maintaining that “Centre”? The stresses on the bow arm and through the string arm should be the same thus maintaining an equilibrium.

Now close the eyes to gain a heightened sense of what your body is telling you about that position.

Much of the previous 2 articles have concentrated on the most efficient line when on flat ground. But what of those courses that Ballands regularly sets out? You know, the ones in the woods, where there are trees in the way or a branch in front of the target? The challenge for any archer in the field style is to modify that perfect stance and still retain much of the function that it allows.

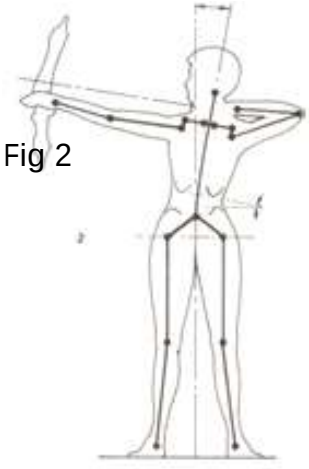


Fig 2

Up hill and down dale

When altering from flat ground to shooting up or down hill it is easy to adopt the adaptation shown in Figure 2 and this seems like the best option at 1st glance. It maintains the foundation stance in the leg and pelvis, the line of the arms in relation to the arrow and bow remain. However the centre of gravity is moving toward the back foot and the lower ribs and pelvis are beginning to be squashed together, increase this elevation and pain will be introduced at the waist as clothing belts and the bones are squashed and compressed. The solution offered in Figure 3 shows the shift in the foundation unit as a side shift in the pelvis; pushing the leading hip

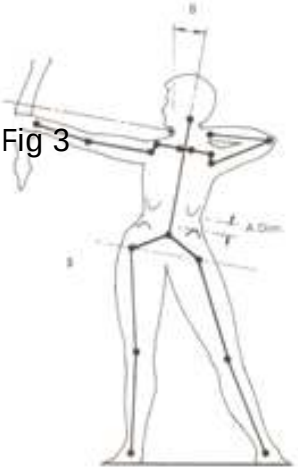


Fig 3

toward the target so the line from the nose falls evenly between the feet, maintaining balance. The power unit remains symmetrical. This maintains the even use of the muscles and providing a similar feel in the arm and torso to a level shot thus promoting consistency between shots.
A similar solution to shooting down hill is applied by side shifting the weight toward the back foot.

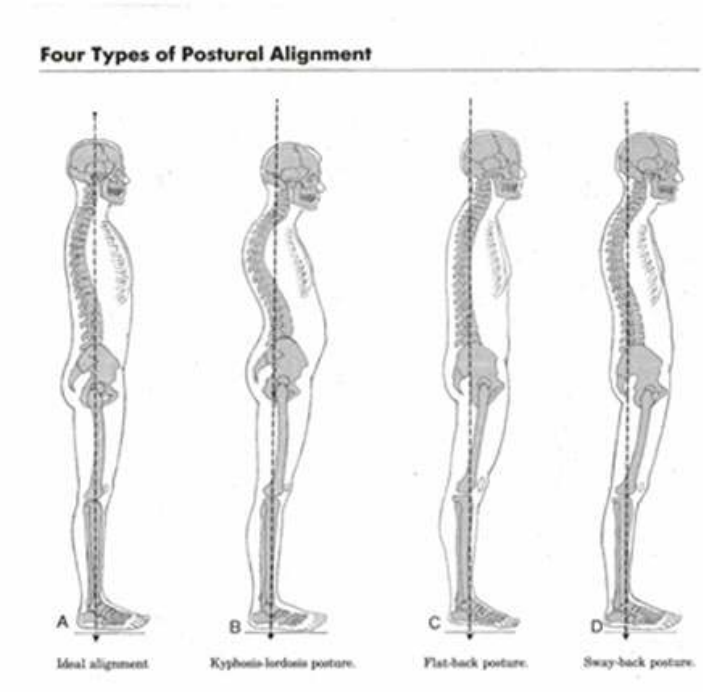
4 - And if the ground slopes?

The articles have been about level ground shooting. This does not apply to the Field domain very well and some consideration of shooting a level stance to a target either up or down a slope was looked at last time.

This alteration is easily to apply to the slope being under the feet as a small modification of the system used for uphill and down dale targets are appropriate if not on level ground. The principle remains as before, the alteration of the foundation unit to cope with the slope along with giving the power unit a solid base to work from and allow for a vertical spine and the centre line of force dropping to the ground between the feet. The aiming unit is then kept horizontal for distance perception and the power unit remains symmetrical to provide even muscular action in the draw.

So what next?

All this considers the stance in the lateral aspect and we have neglected to mention the Antero-posterior view. Returning to the core idea of efficient muscular use freeing up energy to make and deliver the shot the following diagram “A” indicates the most efficient gravity line in the AP plane.



In practical terms we are looking for the earlobe to be over the shoulder before turning the head to make the draw, the vertical line this describes should then pass down to the ground without deviation; passing through the vertebra where the last rib is attached, through the centre of the hip, knee and falling through the foot in a line forward of the ankle but where the shin and the foot meet.

In this diagram the other variations “B” to “D” are not all due to laziness or “poor posture”. Some are due to spinal issues which are treatable with Osteopathic / Chiropractic help and some are set in the spine from the growing years.

The closest to posture “A” the archer achieves the more efficient the spinal and abdominal muscles are able to act and the least energy is then used in making the shot. To achieve this some core muscle strengthening may be needed but certainly the best possible mobility in all the spinal areas is required to be able to adjust the posture toward the ideal in an easy unforced way.

The external indicators that the abdomen needs to be worked on are whether at full draw the buttocks and abdomen are protruding in a way more exaggerated than in the normal stance. This will force the weight into the toes and move the centre of gravity forward of the body, introducing increased back muscle action.

5- Isn't there enough to think about?

On the shooting line we are concerned with the shot, the target and the fact that the course layer has placed the pegs so a tree limb is in the way (bless them, they do like their fun!).

I have noted a commonality among the most successful archers in the club. They all go through a mantra / checklist in their heads for every shot. They start from the ground up, every time. To some it is so much second

nature they have probably forgotten they even do this but on close observation it is clear that it occurs (and even if they know they're being watched it doesn't put them off!).

So how do they get there every time? They have made their body learn the positions and repeat them consistently, they have formed a habit and that only comes with repeating the same thing over and over until the nerves used to make the muscles act always fire in the same pattern.

For the rest of us mere mortals here are three things that will assist in getting to that efficient and consistent point when you come to shoot:-

First, swim backstroke; alright, you don't have to get into the pool! Just backstroke the arms whenever you can even a few times done regularly throughout the day would help. This opens and stretches the chest wall (pectoral muscles) it will allow you to bring the head up more easily and achieve the core posture exercise described third.

Second, abdominal curls, sit ups they are not; and 30 seconds a day done before you rise will make all the difference. Turn onto your back in bed draw up your knees and leave your feet on the surface. Reach forward with your hands to touch our knees will engage the rectus abdominis. Lay back and repeat, 30 times should be enough. To work on the oblique set of abdominal muscles simply repeat the curl reaching forward with the right hand to the left knee and left hand to right knee making sure you have relaxed back between each movement.

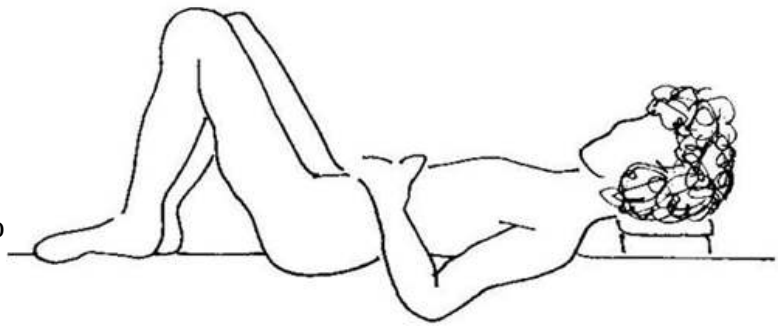
Third, basic Alexander Technique, this is not a substitute for a professional session with an Alexander teacher but will certainly give a good start.

Lay on the floor on your back with a book under your head of about the height of ½ a ream of paper. Bring the knees to the chest and then allow the spine to roll flat to the floor until the soles of the feet rest on the floor, the knees will be raised; turn the heels out so the knees fall together and you can relax your legs.

Give yourself a double chin! Allow the crown of the head to stretch up to lengthen the spine, this stretches the back of the neck, relax.

Bring the right arm across the body and on coming back allow the shoulder blade to flatten on the ground, let the elbow rest on the ground and place the hand on our abdomen, repeat with the left arm.

Allow a minimum 5 minutes in this position, ideally you'll be concentrating on the spine lengthening and your height extending through the top of the head and down through your tail. In practice I like to listen to some music or the news as I get easily bored doing this! The abdominal curls and the backstroke will make all this easier to do.



I think this promotes an efficient, consistent style that reduces the risks of injury, either specific or repetitive strain; one that is easily repeatable on the shooting line.

6 - What did the Olympics teach me?

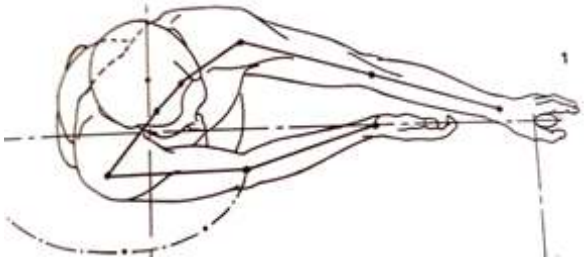
Like many I watched the Olympic Archery. But instead of watching the arrow I watched for the stance of the archers. I noticed a variation in the postures of many of the competitors and some definite stylistic variations based around country of coaching.

The most obvious posture habit, and one favoured in the Eastern countries and taken on by most of the rest of the Archery world, is to take the centre of gravity forward and over the ball of the foot. The rest of the body is held straight. In essence they achieve the efficient upright posture already discussed in the articles I have presented then lean forward using the motion in the ankle only, until the ear lobe is vertically above the ball of the foot. The head is tilted back slightly to bring the eye axis to the horizontal and they shoot from this position.

These pictures of the Danish archer C. Christiansen and Team GB archer Larry Godfrey shows the angle of the body leaning and the straightness of the ankle to head line.

It appears that this is adopted to allow for clearance of the bow and string away from the archer to minimise or negate the effect of the body on the string, it is at odds with the principle of energy efficiency as it introduces extra demands on the calf muscles and in the lower back area.

Abdominal strength is required to achieve the straight line of ankle to neck that these two are demonstrating. It may be that they are trading off the energy efficiency for a greater gain in consistency by minimising the outside influence of themselves on the bow; it also allows for the desirable closing of the triangle (seen from above) that the bow arm, string arm and chest make at full draw.



Looking at the archers in the lateral plane there is even balance between the left and right in the power area of the chest wall, the line of the arrow through the arm and across the shoulders is straight as is normally taught.

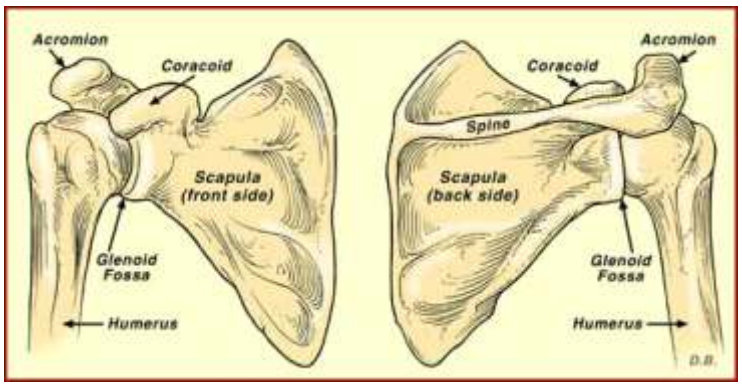
7 - Shoulders

One of the most common injuries in Archers is with the shoulder joint though the researchers note that most of the injuries are from poor handling of equipment mainly due to not participating in an induction programme or proper education, shoulder injuries formed a small portion of their sample[1]. In another article where only elite archers were interviewed, 11 of 21 archers had at some point suffered shoulder injury, there was a predominance in female archers[2].

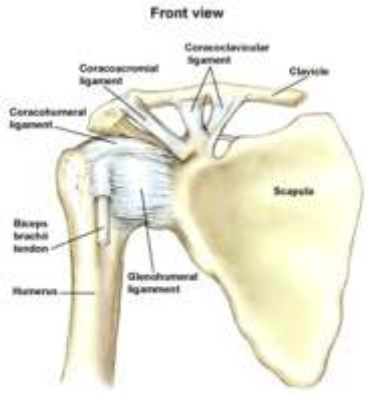
This article is part 1 of several about the shoulder, and a good starting place is to understand the anatomy.

The Bones

The shoulder joint itself is the joint between the shoulder blade (Scapula) and the upper arm bone (Humerus); however, the joint is affected by much wider ranging anatomy and it is wise to consider the collar bone (clavicle) to Scapula joint and the movement of the scapula on the chest wall when looking for resolution to shoulder injuries.

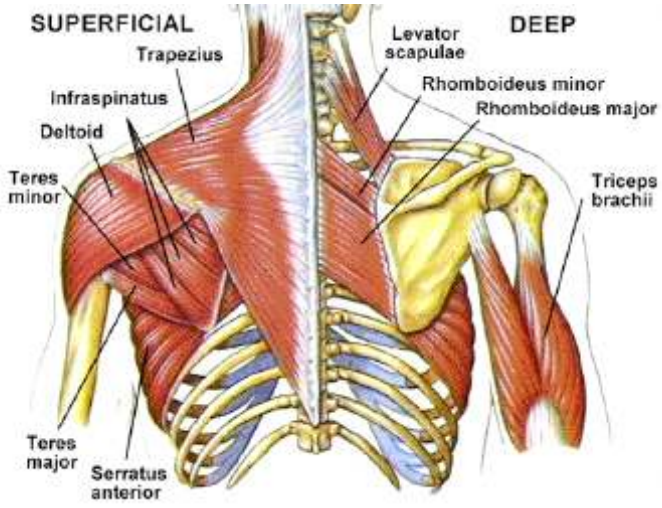


Ligaments



Due to the large range of movement in the shoulder there is a high degree of laxity in the ligaments of the shoulder and the joint does not rely on those ligaments for any stability. The scapula to thorax junction is maintained by muscular action alone so no ligament issues arise. The clavicle to Scapular joint does not move a great deal and is reliant on ligaments for stability.

The diagram shows the relevant ligaments in the shoulder.



Muscles

The stability and movement of the shoulder is wholly tied in with good muscular action. Maintaining good strength in these muscles is important for an archer to enable easy smooth use, well within capability, rather than the more damaging use into the extremes of ability which will precipitate damage.
There are 2 layers of muscle tissue for the shoulder joint and several more sets between the shoulder complex and the rest of the body. They can be split into 3 main functions, those that point the scapula in the right direction; those that stabilise the joint and those that actively move the shoulder joint. Most of the relevant muscles are shown here.

The movers of the scapula are those that join the torso to the scapula, muscles from the neck , back and lower back all act in this way, there are also muscles running between the scapula and the ribcage included in this group. The stabilisers are deep inside and close to the bones and run from the scapula to the humerus. The prime movers of the shoulder are larger and nearer the skin surface they run from the ribs in front , from the scapula and clavicle and from the spine and pelvis at the back.

For the whole unit to work well all the actions should be in balance.

In the next article we'll look more closely at injuries and how to avoid them.

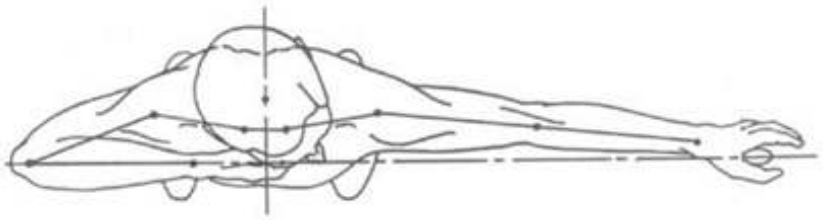
Refs
1) The Journal of Sports Medicine and Physical Fitness 2012 June;52(3):293-9
2) Canadian Journal of Sport Sciences = Journal Canadien des Sciences du Sport [1989, 14(2):85-92]

8 - Shoulder injuries (rather than diseases)

There are any number of ways to classify injuries but for the purposes of this article I'll stick to grouping them into tissues, muscle, tendon, ligament and bone.

Bone injuries are either “traumatic” or “degenerative” . Traumatic, a fracture, has obvious implications and treatments. The degenerative cases relevant to pulling a bow and shooting an arrow are issues with the collar bone joint to the shoulder blade, the ball and socket of the shoulder or the spine, especially at the base of the neck. Wear and tear can occur to any mobile joint and is more likely when inappropriate postural or compressive stresses are placed on it. There are certain genetic factors that alter the speed of degeneration but it happens to us all in varying amounts.

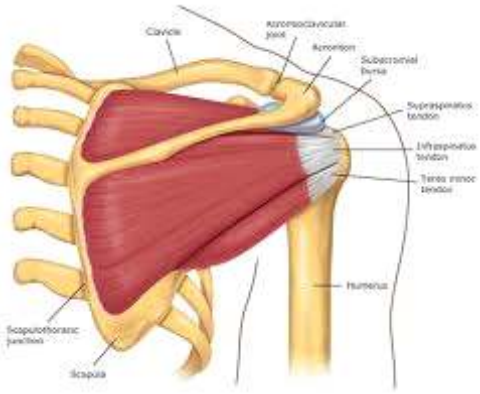
Wear and tear (osteo-arthritis) at the base of the neck can give altered posture, pushing the head forward; and in more severe cases some nerve root entrapment issues which alter power and sensation in the arm. All this impacts on your anchor point and your ability to achieve making the line between bow arm and string arm as



straight as possible. Rigidity and curvatures in the spine will be the subject of another article. Tendon injuries are in themselves the tendons are rarely injured unless some outside abrasive force is applied. Ruptures in tendons

do occur but in many cases are due to long term stresses. In the shoulder area inflammation of the tendon is most common on the Supraspinatus tendon and this is mostly due to abrasion as a secondary effect due to reduced clearance for the tendon under the end of the collar bone / shoulder blade. Most other associated injuries come from the muscle to tendon and tendon to bone junctions failing due to excess pull forces being applied to the muscle. Supraspinatus tendonitis is prone to calcify and requires expert medical help to address.

Ligament injuries occur when the range of movement in the joints are exceeded and there is a pull or traction force along the line of the ligament, it is normally the bone attachment that fails first. When there is sufficient muscular control over a joint the ligament injury itself rarely affects shooting.



The shoulder, mainly being considered here, is not prone to ligament pulls as the joint is not put into the end of its range during shooting.

One thing affecting the ligaments of the shoulder that will seriously impact on the range of shoulder movement is “frozen shoulder” or Adhesive Capsualitis; this is where inflammation from another area tracks into the shoulder capsular ligament sack and sticks the ligaments together from the inside. This results in a shortened ligament for a time and reduces the function of the shoulder, sometimes by 90-95% or more. This will effectively cease shooting for a time. The good news is they recover - usually completely.

Muscular injuries are by far the most common in archers and the Rotator cuff is most prone to injury. The anatomy was mentioned in the previous article, but as a reminder, there are 2 layers of muscle supporting the shoulder, the larger prime movers are the outer layer and the inner are the rotator cuff. The cuff is made up of 3 muscles attached from the shoulder blade and wrap around the shoulder joint.

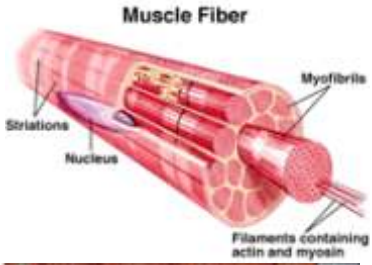
Injuries are usually “pulls” to the muscular tendinous junction associated with poor shoulder position in the draw and / or poor training and / or an excessively heavy bow draw weight any of which can cause forces applied to exceed the muscular ability. There are other activities outside archery that will negatively impact on the rotator cuff muscles. Simply throwing pebbles into the sea can extend the shoulder movement into the muscular and ligamentous ends of range and with repetition can cause shoulder injury.

Correctly lining up forces through the shoulder and working on muscular strength to gradually increase draw weight will prevent these injuries. The exercise need to be applied in gradually increasing amounts over time and at least 3 times a week to be of any use, even then it will take some time to achieve the necessary improvement to fitness and ability and more effort and commitment to maintain it.

Look for further discussion on this in the next article where part 3 of the shoulder series to look at prevention and position will be looked at.

Article 9

This is a longer article than usual, with less pictures, as the subject requires that all of the information be delivered in one go. For those with the patience to spend time and read it – thank-you!



Injuries and prevention

Injuries can be grouped in a number of ways but for the purposes of this article I'm grouping them in tissues i.e. muscle, ligament, tendon, bone, etc. I'm only going to consider musculoskeletal injuries rather than discuss disease states that affect the tissues (hypermobility states and rheumatoid conditions).

Muscle

Most injuries of muscle occur at their junctions with other tissues, either where they arise from the bone at their origin or where they join to a tendon, injuries are typically a separation of the tissues with inflammation and subsequent scarring on resolution which leaves the tissue weakened and usually thickened.

Cramp is a chemical issue – either dehydration or lack of electrolytes being the cause.

Spasm in a muscle is either driven by nervous information the control mechanisms being set too high or as a secondary effect providing protection for an underlying issue.A ”pulled” muscle, where the filaments of the muscle are pulled apart lengthways, is not as common as supposed and most pulled muscle diagnoses are muscle to tendon strains or localised knots of fibrous tissue that allow a build-up of lactic acid and cause a burn pain.

Muscle Function can be altered by lack of Vitamin B_1, B_2, B_3, Magnesium and Zinc all of which are required for energy production from either sugar or fat. Low oxygen supply will stall the production of energy and cause lactic acid build up – typically the “tired ache” after heavy exertion is caused by this.

Ligaments

Ligaments join bones together and are passive in respect of the function of the joint. They serve to limit ranges of movement to prevent dislocation or inappropriate movement. Injuries to these are caused by overextending the range of movement - effectively “throwing” the joint range into the buffers in an uncontrolled movement where the ligament is snapped taut thus damaging the fibres themselves or “pulling” them from their bone attachments.

Tendon

Damage to the integrity of a tendon is near impossible in the normal case, the tissue is simply too tough, the gristle that is too tough to eat even after hours of stewing isn't going to lose integrity in a normal mechanical sense. So injuries involving tendons are mainly confined to their attachments to the muscle or the bone.

Ruptures and “avulsion” occur between the tendon and the bone or the muscle and the tendon.Some tendons can be “abraded” when they pass near to another structure and thus become inflamed – a tendonitis. This case arises when there is some disturbance of the muscular control of a joint or when there is extra bony growth that impedes the run of the tendon.

Cartilage

This is the covering of the bone end inside the joint. It forms the articular surface of the bone. It can be damaged by impact injuries and degenerate by losing density thus roughening the surface. Movement of the joint with a rough surface generates friction damage and inflammation – an arthritis.

Bone

Bony tissue damage from fracture is fairly obvious – some trauma has broken the integrity of the bone. Pathological fractures occur where e.g. a lung tumour gradually erodes the bone and eventually it fails.

Trapped Nerve

Mainly used as a colloquial term for muscle spasm where the muscle reacts suddenly and violently, seemingly like an electric shock, thus giving the impression of an electrical event. If a nerve is impeded then the alteration or loss of signal gives a number of varied symptoms in the area of supply of the nerve ”wire”. This includes tingle, pins and needles burning hot or cold and complete numbness. This is an effect rather than an issue in its own right being caused by some other condition along the path of the nerve.

Injury avoidance

Simply put – do it correctly!

The method of shooting with the weight borne in the correct place and the technique being what it is exists for two reasons.

First - to achieve the best shot so you achieve what you wish to do and

Second – to limit the risk of, or prevent, injury to yourself.

The results of hundreds of years of practice and “trial and error” have brought the technique to what it is, thus the reason it is done that way. Poor posture in the shot and poor execution will ultimately lead to strain. This strain will be either of a significant level (instant injury), or by repeated bad technique it will cause a repetitive strain injury, in whichever tissue is put at risk. Initial good technique does not prevent sliding into bad habits.

The ultimate long term solution is to change the cause. Go back to basics, have one of the coaches observe your technique and offer up alterations to allow your technique to become better.

Once an injury has been sustained a good mechanical assessment to discover if there is an impediment to recovery is important, to understand the nature of the condition you need to resolve will inform the forward strategy for your recovery. There is no one stop shop for this so you may have to see multiple professionals and have a number of examinations done.

Once you have the information you need, have decided in discussion the route and treatments you are going to use the body must be allowed time to resolve the tissue damage, remove the cause, aid the healing process, prevent a repeat injury.

Next time some specific injuries at the shoulder.

Andrew Knight D.O.
Osteopath
Coombedene, Coombe Hill, Keinton Mandeville, Somerton. TA11 6DY
Phone: 01458 223300
Text: 07889857289
eMail: osteopath@andrew-knight.co.uk