No 37: The head-neck junction (III)

Gerald Foley CTC 24 February 2015

1. I have been spending quite a bit of time on the head-neck junction.
2. I have been working through a longer and more detailed paper which I have put on my website and into the library so that you can have a look at it any time you like.
3. In looking at the head-neck junction, I find it useful to look at it on three different levels all of them of great importance to us. But like so much in what we do, you have to keep going round and round them rather than becoming exclusively fixed on getting each one "right" before moving on to the next.
4. The first way of looking at the head-neck junction is as one of the major hinge-points in the body. We have the ankles, knees and hips. At the top, we have the head balanced on the occipital condyles.
5. Unless the neck is able to move freely on top of the neck, the whole balance of the body is affected. Instead of being a subtle self-adjusting mechanism the body becomes more clumsy in its movements.
6. I mentioned the way having a neck-brace makes us more clumsy or the way people with over-developed neck musculature like wrestlers and rugby players tend to walk around in a lumbering way.
7. For most people the stiffness in the neck is not as severe as a neck brace. But if is even slightly stiff or working as it should, it will interfere with the way we use ourselves when we are going about our daily life at work or in the home – or when we are taking exercise like jogging or going to the gym. There is always room for improvement.
8. The second level we looked at is the way a sub-optimally working head-neck junction affects the working of the exteroceptors – the eyes and the ears. Unless the head neck junction is working smoothly, the connection between the eyes and the movements of head, and the way this cascades down the body will not be as it should.
9. We looked at the way the rest of the body follows when we roll our eyes up and down or when we rotate them to one side or the other. If our head-neck junction is not as free as it should

be then the movements of our eyes are more jerky and strained than they should be.

10. We are not as aware of the importance of a free neck to the workings of our ears. But our survival in our evolutionary past depended on our ability orient our head so that we were exactly facing the direction from which a possibly threatening sound was coming.
11. The way that works is that our auditory system is able to detect the tiny difference in timing that happens when a sound comes from one side. The side facing the sound hears it slightly earlier than the other.
12. We do that automatically or reflexly by finely adjusting the direction our head is facing so that the sound comes into both ears at the same time. We then have a sense that it is straight ahead. This requires very high precision in the working of the head-neck junction.
13. I mentioned the way birds are particularly good at turning their heads around. They can even turn it right round. Marie mentioned they have extra neck vertebrae and some of them like flamingos have an awful more than us.
14. So if you are giving a lesson don't be worried if your pupil's neck isn't as free as the budgie's
15. Today I want to look at the third level of functioning of the head-neck junction. I will be dealing with a curious arrangement of very small and extremely sensitive muscles in the head-neck area. These are called the small posterior and anterior sub-occipital muscles and I have been thinking and wondering about ever since I was doing my training when I wrote a paper about them which is in the library
16. I don't think there is much wrong with it except that it is does not go quite far enough.
17. As to where these muscles are, you remember the way the head sits on the atlas vertebra and the atlas sits on the axis vertebra with which it is interlocked. They are tucked in just below the occipital bone of the skull..
18. These muscles come in two groups. Those behind the balance point of the skull are known as the posterior sub-occipital muscles; there are four to the left and four to the right.
19. At the other side of the balance point there are two on either side that are known as the anterior sub-occipital muscles.

20. The two are antagonistic to each other in the sense that each group opposes the actions of the other. This is why they function as a group, like for example, the various muscles involved with flexing and extending the arm.

21. These are very small muscles but they are also rather special ones in that they have some of the highest densities of muscle spindles of all the body's muscles.

22. Spindles are the tiny sensors in muscle fibres that register the extent to which a muscle is being stretched.

23. In normal life, if someone tries to pull your arm hard, there is a reaction to it that is known as the stretch reflex. The muscle contracts which prevents your arm being pulled out of your shoulder. Sherrington explored it in some detail.

24. Because of the number of spindles they contain, the small sub-occipital muscles are extremely sensitive to being stretched. They are over a hundred times more sensitive than say their big neighbours the trapezius or the sternocleidomastoid.

25. But, quite surprisingly, apart from this kind of basic physiological data there is very little information about these muscles group and what they do – what they are for – in the ordinary physiology textbooks. In Tortora and Grabowski they are not even mentioned in the index.

26. *Stone and Stone*[1] which we have in the library is a very useful book in that it looks at the various muscles in the body one at a time. If you look at the sub-occipital muscles individually, you will see that their actions are listed as flexing, extending and rotating the skull. (pp62,63 and 66-70)

27. But given that they have much bigger and stronger muscles outside them this is obviously not their job so we have to work out what it might be. As an engineer, it seems fairly obvious to me.

28. These muscles are not contracting in order to pull the head backwards and forwards or twist the head round on the atlas and axis vertebrae. They are simply too small and weak to have significant action in comparison with the trapezius, platysma or sternocleidomastoid.

29. What is happening is that the movements of the head are being carried out by the big muscles and this is stretching the sub-occipital muscles and activating their spindles. They are

[1] Stone and Stone (2000) pp62,63

acting as strain gauges, measuring what is happening to the head rather than making it happen.

30. If you poke around in the anatomy and physiology textbooks you will find the odd indication that this is actually what is happening. There is a reference in *Gray's Anatomy* which says:

> *Obliquus capitis superior and the two recti are probably more important as postural muscles than as prime movers, but this is difficult to confirm by direct observation.*[2]

31. This is because the sub-occipital muscles are tucked away inside the big muscles and it is very difficult to dig around inside them to measure what is happening in the sub-occipitals. And if you do, one of the effects is that the neck will not be as free as when you started.

32. Another paper wonders whether they might be viewed as fine-tuning muscles that

> *…that can be called into play independently of lower cervical joints, to position the skull for the needs of sensory and motor system associated with the skull, such as vision and audition*[3]*.*

33. This is the point I was making about the delicate movements of the skull when we are moving our eyes about trying to locate where the sound of something is coming from. But I still think the head-moving job is done by the big muscles and the sub-occipitals are measuring what is happening.

34. If we accept that the role of the sub-occipitals and their spindles is to monitor the movements of the head, the question is how does information get into the brain and what does it doe with it.

35. This is where it gets particularly interesting. If we look at the nerves that govern the sub-occipital muscles we see that they come from what is called the cervical plexus. This is a complicated neurological arrangement at the top of the cervical spine which according to *Tortora and Grabowski* supplies:

> *The skin and muscles of the head, neck, superior portion if the shoulders and chest, and diaphragm.*[4]

---

[2] Williams (1995) p813
[3] Richmond et al (1992)p145
[4] Tortora and Grabowski (2000) p430

36. The nerve supply to the small sub-occipital muscles overlaps and intermingles with that for the postural reflexes identified by Magnus.

37. So what we have is a muscular system which is delicately set up to measure the flexure, extension and rotation of the head relative to the neck and feed it all into the nervous system which controls the postural reflexes.

38. This is entirely plausible. But if it is to work in this way, it depends on the head-neck junction being free to move so that the spindles in the sub-occipital muscles can be activated. If the head is pulled down on the neck, the whole sub-occipital arrangement simply does not work.

39. Because there has been so little work on the working and the function of the sub-occipital muscle arrangement, we cannot say in any detail what there is on the general health and well-being of the human body if we fully partly disable this system.

40. But we can say that evolution is not frivolous. Such a complex and delicate mechanism as this must have serious benefits to evolve. When we disable it by pulling our head back and down we are conducting an experiment on ourselves which could have effects not just on the way we use our whole postural musculature but on the performance of our eyes and ears as well.

41. There have been some extravagant claims sometimes made on behalf of the AT not least by Alexander himself. Wilfred Barlow, himself a practising medical doctor, in the first edition of his book *The Alexander Principle* wrote about the first seventy five years of the Technique when among teachers there were:

> *No coronaries, no cancers, no strokes, no rheumatoid arthritis, no discs, no ulcers, no neurological disorders, no severe mental disorder, just occasionally some unlikely behaviour; accidents inevitably , but recovery to good functioning and no accident proneness.*[5]

42. When he revised it twenty years later he said

> *…inevitably more teachers have died, a few with cancer. But what I wrote still holds good. By and large, a standard of day-to-day health and happiness which most people encounter in their earliest years.*[6]

---

[5] Barlow (1973)p16
[6] Ibid.p16

43. We rightly and prudently reject any such extravagant claims for the benefits of the AT. But when I look at the head-neck junction and especially the sophistication and delicacy of the sub-occipital muscle system, I confess to a feeling that there may be more substance to some of those claims than we dare admit today.

44. There is interesting scientific work to be done of AT.

References

W. BARLOW (1973) *The Alexander Principle* - Vista London 1988

F. RICHMOND, e. al (1992) *Heterogeneous structure andfunction among invertebral muscles* in in A. BERTHOZ, P. VIDAL and W. GRAF (1992)

R. J. STONE, J. A. STONE (2000) *Atlas of skeletal muscle* - McGraw-Hill., Boston 3rd ed

G. J. TORTORA, S. R. GRABOWSKI (2000) *Principles of anatomy and physiology* - John Wiley and Sons, 9th ed

P. L. WILLIAMS (1995) *Gray's Anatomy* - Churchill Livingstone, Edinburgh 38th ed