No 36: The head-neck junction (II)

Gerald Foley CTC 4 February 2015

1. The last time we were looking at the head-neck junction. It is an area of major interest to us as AT people.
2. At the broadest level it is one of the four main hinge-points in the body – the others being the hips, knees and ankles. We saw how it plays an important role in the overall balance of the body.
3. Today I am going to probe a bit more deeply into the working anatomy of the joint but I am also going to try to give you some idea of its wider and subtler effects throughout the body. The more we look into that the more interesting it becomes.
4. It also gives us some clues or suggestions about why the AT can be so surprisingly effective in different ways. We certainly do not want to over-claim for the AT but I think there is a lot more to be found out and a lot of it relates to the head-neck junction.
5. We had got as far as looking at the way the head is delicately balanced on the occipital condyles. We also saw that the balance point is way up the skull on the top of the atlas vertebra.
6. Below that there is another vertebra called the axis. The axis has a little tooth, called the dens, which sticks up from it and goes into a little hole in the atlas so the two are effectively locked together.
7. We also looked at the degree of flexion in the neck. We saw that the neck itself does not bend a great deal. So for nodding movements of the head we either get it right up at the hinge point, or we have to bring the rest of the body into it.
8. We explore this in our eye- games. In one of these, I stand, looking ahead and roll my eyes upwards as far as they will go without moving anything else.
9. I now let my eyes take me further back. If I can manage to keep my neck free so that the head is nicely rotating on the condyles this happens nice and smoothly with only minor compensatory balancing movements in the rest of my body.
10. But if the head-neck unction is stiff, I have to bring the rest of my body into it and the movement instead of being smooth becomes more lumpy because I have transferred the rotation down to my hips which cannot move with the same delicacy.

11. Now let us look at neck rotation. In contrast with the nodding movement, there is quite a lot of rotational freedom in the neck. So I can twist my head until I am looking over my shoulder.

12. We can see this ability very clearly in cats which can twist their heads a long way around

13. Some of you may have been reading the book *H is for hawk* which won one of the recent literary prizes. It is about training a goshawk for falconry which is really interesting and rather scary. The nearest I ever got to that was when I got the budgie to stand on my finger.

14. But in either case you get to see the remarkable rotational capacity of the neck in a bird. Birds can twist their heads right round and look straight behind them.

15. But again we find that if we tighten the head-neck junction we reduce our ability to look around. It is like having a crick in the neck or wearing a neck-brace.

16. We get the same effect if we have over-developed neck muscles. Our general movements become more awkward. Look at the lumbering way in which rugby players and wrestlers move.

17. So far so interesting. But the working of the head-neck junction has implications for more than just looking round. It has a major effect on the working of those organs that tell us about the external world – the exteroceptors.

18. For humans these are the eyes and the ears and to a much more limited extent, the nose. With other animals it is different – dogs rely on the nose, bats rely on their echo-location equipment, migrating birds seem to rely on the earth's magnetic field and so on.

19. Let's think of the eyes. When the neuromuscular system is working as it should, our natural upright posture is with the eyes in the centre of their sockets, looking horizontally straight ahead, and the head nicely balanced on the occipital condyles.

20. When something comes into my field of vision, my eyes turn automatically towards it so that they are no longer central in their sockets. This brings into play what Magnus called the head-righting reflexes.

21. These automatically twist the head round to face the object which allows the eyes to become to their natural resting position of being central in their sockets.

22. My neck is now twisted which mobilises other reflexes which bring my shoulders round – which untwists my neck. Then my hips come round into line with my shoulders and, if I am standing, my feet will come into line with my hips.

23. This is a beautifully smooth sequence – head – neck – shoulders – hips – knees and feet. But it depends on the head-neck junction being free enough to start the whole thing off.

24. If it is not, the movements instead of flowing gently into each other become crude and lumpy. There are tightnesses all over the place. The eyes are not behaving in the smooth free way they naturally do.

25. It is rather more surprising how the proper functioning of the ears also depends on a free neck.

26. We are able to tell the direction from which a sound is coming because of the tiny difference in the timing of the sounds reaching each ear. If the sound is coming equally into each ear as we are facing the direction from which it coming, it is straight ahead. Otherwise we sense it as coming from the right or the left.

27. Most of the time this happens reflexly, but sometime we find ourselves trying to aid it by pointing one or other ear towards where we think the sound may be coming from.

28. Once we have located the direction of the sound we usually use our eyes to locate the sound source more accurately but we are perfectly capable of telling the direction of a sound in the dark.

29. You can see how a head-neck junction that is not functioning properly can interfere with our ability to locate the precise direction from which a sound is coming.

30. In the modern day, with so much noise everywhere, not being able to locate the exact source of a sound may not make any practical difference though in less noisy times knowing where exactly the rustling in the undergrowth was coming from could be a matter of survival.

31. So keeping the head neck junction free is a good thing. But as Alexander told us we have a tendency towards faulty sensory perception. The more we try to keep our neck free, the more we find people tightening it.

32. This is a good reason to look at indirect ways of achieving the same thing. Think of the jaw muscles. Anyone who wants to look them up will find there are plenty.

33. If you are interested in anatomy, you can make a great list of them – they are the muscles involved in mastication, chewing, yawning, smiling, laughing, and changing facial expressions

34. It is clear they all affect one another and the head-neck junction. It is impossible to tighten one's jaw muscles and clench one's teeth for example without stiffening the neck.

35. It is also impossible to smile properly if your jaw is stiff. This is why we ask people to think of something funny rather than just pulling the mouth into a smile.

36. Inside the mouth, we have the tongue which is more or less pure muscle and is surrounded by various muscles which work on it while it goes about its various jobs connected with mastication of food, talking, singing and other forms of vocalisation.

37. Sometimes we hold the tongue pressed against the roof of the mouth or against the front teeth. When we do, we can see there is an effect on the tightness of the head-neck junction.

38. We also have the muscles of the soft palate that control or influence various aspects of swallowing, breathing and vocalisation.

39. It is not necessary to know all about these functions in detail but it is important to recognise the muscular complexity and the degree of muscular interaction in this area.

40. At a neurological level there is a high degree of interlinking between the nerve fibres from the brainstem and the top of the spinal cord. We need this interlinking if we are to avoid acting as though we are made up of mechanically separate points rather than the joined up entities we are.

41. An example I like of this kind of joined-upness is the vagus nerve. This is the tenth cranial nerve and innervates muscles in throat and neck as well as the smooth muscle in the stomach and large and small intestines.

42. When I look at my watch and see how late I am going to be, I get a stiffening of the neck as well as a lurching in the guts.

43. From all of this we can see that avoiding pulling the head back and down, allowing the jaw to be free, smiling, freeing the

tongue all make a great deal of sense when we are trying to free our neck.

44. I think it also shows that there is no way we can get into the release of individual muscles. It is useful to have a general idea of what is going on but I don't think a knowledge of the detailed anatomy is necessary.

45. In fact, I have found telling some people to release their soft palate is effective precisely because they have only the vaguest idea where it is and have no idea how to release it. But it takes their mind off trying very hard to free their neck.

46. All of this shows the complexity and delicacy of the head-neck junction and its overall importance in the working of the body. But there is one other aspect of it which convinces me that it is even more important still. I mean the small sub-occipital muscles.

47. I became interested in them when I was doing my training and I wrote a paper about them in which both Walter and Dilys showed a flattering amount of interest. It sets out quite a few of the basic facts and is available in our archives for anyone who wants to read it.

48. The essence of the story is that there are two sets of tiny muscles tucked away between the base of the skull and top two vertebrae. There are four on each side at the back and two at each side to the front. They are acting to balance each other.

49. The conventional idea is that they act with the other muscles of the head neck and shoulders to assist in the nodding and rotational movements of the head but to an engineer that cannot be true. There are plenty of bigger and better positioned muscles to do that job.

50. I am convinced that their job is act as very precise monitors of the movements of the head. The nerve centre controlling these is at the top of the spinal cord adjacent to the centre controlling the postural centres identified by Magnus in the brainstem.

51. It means the small sub-occipital muscles are part of the postural control system for the whole body. And judging by the complexity of the whole arrangement, it would not have been selected by evolution if it did not meet and important need.

52. If we jam our head back down onto our neck we disable this amazingly elaborate monitoring system. Who knows what subtle ill-effects flow from it?

53. This has been a quick tour of the head-neck junction but I hope it gives you a sense of how complex and important it is. cts. There is plenty of material for scientific investigation.

54. But in the meantime we can take confidence in the rightness of our belief in the benefits of freeing the neck.