Endoscopic anatomy of the ulnar nerve: a useful adjunct to teaching anatomy

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ABSTRACT

INTRODUCTION There has been a shift away from gross anatomy teaching and hands-on cadaveric dissection. This has been replaced by a variety of teaching modalities including problem-based learning, models and prosections, and computer-assisted learning. We aim to pilot a technique of endoscopic visualisation of upper limb anatomy, to produce a video that can be incorporated into anatomy teaching and to assess the video qualitatively as an adjunct to anatomy teaching.

MATERIALS AND METHODS A single, previously undissected, formalin preserved cadaver was used and views were obtained of the left arm. The video was shown to 10 surgical trainees who were then asked to complete appraisal forms anonymously.

RESULTS The endoscopic views were thought to be useful and helped the trainees to appreciate the *in situ* anatomy and potential sites of nerve compression. 70% of respondents would recommend the system to others.

CONCLUSIONS We feel this represents another method to help in the understanding of a complex area of anatomy in a way that is unique to endoscopy.

KEYWORDS

Endoscopic visualisation – Teaching – Anatomy

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Following the publication of *Tomorrow's Doctors* by the GMC in 2003,¹ there have been significant changes in the medical undergraduate curriculum. One of the subjects most greatly affected by these changes is anatomy. There has been a shift away from gross anatomy teaching and hands-on cadaveric dissection. This has been replaced by a variety of teaching modalities including problem-based learning, models and prosections, and computer-assisted learning.²

Traditional anatomy teaching based around the cadaver in the first one or two years of undergraduate education concentrated on learning detail rather than relevance. Many argued that this required reform and there has been wide discussion regarding the results of these changes. There are many potential advantages in learning anatomy in a clinically relevant format with multimedia learning resources. However, it is generally accepted that current undergraduates complete their medical education with less anatomical knowledge than in the past.^{3,4}

A broad anatomical knowledge is essential for the practice of any part of medicine and particularly for those carrying out invasive procedures. For surgeons an in-depth knowledge of anatomy is vital to good practice. There has therefore been a move toward postgraduate training in anatomy as part of surgical training. This has of course always been the case with junior trainees spending part of

their training as demonstrators teaching anatomy to undergraduates. The period of time spent demonstrating was valuable and this was reflected by improved success rates of demonstrators in anatomy exams.⁵ However, with changes in postgraduate training there has also been a reduction in the number of these posts.⁵ The result is that trainees' exposure to anatomy is limited. The responsibility of trainers is to provide innovative and interesting methods of teaching anatomy.

The challenge therefore is to produce effective learning resources to maximise trainees' exposure to anatomy. To this end we have developed a DVD of the anatomy of the ulnar nerve viewed endoscopically. This has many perceived advantages. It allows a view to be obtained of the anatomy of the nerve without disturbing or removing the surrounding tissue. Views of the nerve and its immediate relationships are therefore gained. The three dimensional topography and morphology of the nerve can be visualised and the nerve can be followed along its entire length in a 'fly by' manner, allowing the student to see how its relationship to other structures changes along its course.

Endoscopic technology has been available for many years. After its initial development in the 1800s as a curiosity, its development accelerated rapidly in the latter part of the 20th century. Originally pioneered in gynaecology, there

Please tick the box for each item that best describes your rating of the DVD. Please add any additional comments below.

SA = strongly agree; A = agree; D = disagree; SD = strongly disagree; NA = not applicable

CONTENT	SA	A	D	SD	NA
1. Content of the DVD is relevant to your learning objectives					
2. Content is structured in an appropriate manner					
3. Content is appropriate for the level of the learner					
4. Content flows in a logical fashion					
5. Content is appropriate and comprehensible					
6. Video images are clear					
7. It held my attention					
8. It motivated me to use this as a learning objective					
9. I would recommend this to others					

Further comments:

Figure 1 Example of questionnaire

are now few areas of surgical endeavour where endoscopy is not used. The equipment is widely available and many trainees are used to interpreting images obtained through an endoscope. The senior author's wide experience with endoscopy in the field of plastic surgery led him to the idea of using images gained in this way for education.

Many other specialties use endoscopic techniques as training tools and the use of endoscopically derived images has been widely described.^{6,7} The concept of using cadaveric endoscopy to teach anatomy has also been discussed in the literature.⁸ We could find no published description of these techniques used specifically in the upper limb.

Our objectives were to pilot a technique of endoscopic visualisation of upper limb anatomy, to produce a video that can be incorporated into anatomy teaching and to assess qualitatively the video as an adjunct to anatomy teaching. The aim is not to replace other currently existing teaching formats but to provide a further adjunct to the teaching of a complex area of anatomy.

Materials and Methods

The project was conducted in the anatomy department of Hull and York Medical School in the dissection room. A single, previously undissected, formalin preserved cadaver was used and views were obtained of the left arm. An endoscopic stacking system was used in conjunction with the Hoffman cubital tunnel decompression kit and the radial artery harvest kit from Storz (Karl Storz Endoskope, Germany). The majority of the dissection was conducted using the former. This consists of a 4mm diameter 30-degree forward facing endoscope. This is used in conjunction with a sheath optical dissector, which has a fenestrated spatula at the end to allow retraction and formation of a space in which to work and obtain images. Further instruments are used via the same entry point. Open dissection down to the nerve was used at three sites to obtain access for the endoscope. These were at the axilla, elbow and forearm. Further dissection was done entirely endoscopically and the images then recorded on to a CD. The video was then edited on a PC using Windows Movie Maker® (Microsoft, US).

The video was qualitatively assessed using a questionnaire (Figure 1) based on one previously developed for the

assessment of instructional software programmes.⁹ The DVD was shown to 10 surgical trainees who were then asked to complete the appraisal forms anonymously.

Results

The edited video runs for 4 minutes and 22 seconds. There is a descriptive commentary and it is annotated with labelling where necessary. It is structured as a continuous journey along the path of the nerve from axilla to hand, with pauses along the route to demonstrate important points such as the dynamics of the nerve within the cubital tunnel during elbow flexion and extension.

Figures 2–5 show still images taken at the time of recording the video and accompanying schematic diagrams. These are not representative of the strengths of the video but give an indication of the quality of the images obtained.

The results of the questionnaire are as follows and are summarised in Figure 6.

Question 1: Content of DVD is relevant to your learning objectives.

40% of trainees strongly agreed and 60% agreed with this statement.

Question 2: Content is structured in an appropriate manner.

30% strongly agreed and 70% agreed.

Question 3: Content is appropriate for the level of the learner.

40% strongly agreed and 60% agreed.

Question 4: Content flows in a logical fashion.

40% strongly agreed and 60% agreed.

Question 5: Content is appropriate and comprehensible.

30% strongly agreed and 70% agreed.

Question 6: Video images are clear.

30% strongly agreed and 70% agreed.

Question 7: It held my attention.

40% strongly agreed and 60% agreed.

Question 8: It motivated me to use this as a learning resource again.

30% strongly agreed, 50% agreed, 10% disagreed and 10% did not respond.

Question 9: I would recommend this to others.

30% strongly agreed and 70% agreed.

Additional comments were invited. These included positive comments and constructive criticism. The endoscopic views were thought to be useful and helped the trainees to appreciate the *in situ* anatomy and potential sites of nerve compression. However, it was also felt that labelling of some sections could be improved. One respondent felt that it was difficult to orientate the anatomy and that having a better understanding of the gross anatomy before watching the video would have been helpful.

Discussion

The teaching of anatomy has changed for many reasons. The exposure to gross anatomy teaching and particularly to dissection has reduced greatly and the emphasis on anatomy in postgraduate surgical examinations has also decreased. Anatomy remains a cornerstone of surgical practice. New and innovative ways of teaching anatomy have been developed and this needs to continue.

The objective of the project was to produce a video based around endoscopically obtained images of anatomy and to assess it qualitatively. The images and the video are very clear. One of the great strengths of the technique is that relationships between structures can be visualised intact without the removal of tissue. The technique lends itself particularly well to longitudinal structures such as nerves and vessels as

these tend to have tissue planes that can be dissected.

The video was well received by the surgical trainees. The responses to the questions on the questionnaire were universally positive for all but question 8. 20% of respondents ($n=2$) did not feel they would use the resource again. This may be because they found the images disorientating or the video difficult to follow. The comments that were made have been used to modify the video to improve it.

The assessment of this video was somewhat artificial in that trainees watched it in isolation without any other concurrent teaching of the anatomy of the ulnar nerve. The video is not conceived to be used in this way but rather within a package of training resources. The response from trainees was overwhelmingly positive. As with any technique there are drawbacks and it is apparent that some trainees found the video disorientating.

Conclusions

We feel this represents another method to help in the understanding of a complex area of anatomy in a way that is unique to endoscopy. The particular strengths of the technique are in demonstrating the relationships between anatomical structures as nothing is removed. This is particularly evident during movement.

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