ELECTIVE (SSC5c) REPORT (1200 words)

A report that addresses the above four objectives should be written below. Your Elective supervisor will assess this.

I completed the remainder of my elective placement with the neurosurgery department at the Royal London Hospital so that I could compare and contrast this environment with its counterpart in Los Angeles.

My own personal interest meant that I spent the majority of both placements observing tumour surgery. The pattern of disease relating to brain tumours seems largely similar between London and Los Angeles, with relatively common tumours such as meningiomas and astrocytomas forming the bulk of the work-load. The management of these tumours is also distinctly comparable, with both centres having the technological resources to routinely use stereotactic guidance systems to assist in the excision of these tumours.

At the Royal London I also spent a lot of time in spinal theatres and was allowed to perform (under direct supervision) my first facet joint injection on a patient with chronic lower back pain. This is a part of neurosurgery that I am unable to compare with the American health system as this service was offered at an alternative site to the one at which I was based in Los Angeles.

The neuro-trauma aspect of neurosurgery at the Royal London accounts for such a considerable proportion of patients that there is a separate team to specifically manage these patients. The types of patients which make up this sub-division are noticeably similar between the Royal London Hospital and the Ronald Reagan Hospital in Los Angeles – both hospitals are maximum level trauma centres within prime inner city locations and thus deal with high volumes of trauma and are responsible for managing the most seriously injured of patients in these cities. The amount of complex trauma patients seen at these hospitals is also increased by the presence of the Air Ambulance Service at both locations.

The subspecialties of neurosurgery which are less evident at Royal London Hospital are those areas such as neurovascular surgery (non-traumatic) and pituitary surgery. It seems as though the majority of the neurovascular cases (such as cerebral aneurysms) are managed by the interventional radiology service, where minimally-invasive techniques such as endovascular coiling are used. Some of these neurovascular patients are now also being managed using gamma-knife radiosurgery at St Barts. Similarly, the pituitary service appears to be largely separate from the main neurosurgery department at RLH and operates more in conjunction with the endocrinologists at St Barts.

There are obviously sub-divisions such as this within every surgical specialty which allows specific surgeons to cater for a particular sub-set of patients. However, I personally found these subdivisions to be more prominent at the Royal London than at the Ronald Reagan and felt that they were more separated from the main neurosurgery department. This was most evident with neurovascular surgery, of which I witnessed considerably more open-type repair procedures at Ronald Reagan. The only real example of this divide in sub-specialties in Los Angeles was with the spinal service which was located at an entirely different site.

Overall, I think that the pattern of neurosurgical disease is very similar between here and Los Angeles, simply by virtue of both being large, densely populated cities in the developed world with a reasonably similar demographic population and with similar resources available. The overwhelmingly obvious difference I noted between the two health systems was the utilisation of these resources and how services were managed as part of a privately-funded, and therefore largely money-driven collective rather than a state-funded health system. Unsurprisingly, the efficiency and application of services in Ronald Reagan was, on the whole, considerably quicker.

One of the key examples I noted again and again in Los Angeles was the routine procedure used to obtain, deliver and receive the results of pathology specimens intra-operatively. Sometimes the results of these pathology specimens changed the course of the surgery e.g. how aggressive a tumour excision needed to be to prevent recurrence. In the NHS I have only ever seen pathology results obtained days after the operation has finished.

By virtue of this situation which exists in the NHS, it is perhaps unsurprising that I found our neurosurgical department to be far more advanced/familiar with performing brain biopsies using the stereotactic guidance system. This is clearly our preferred method for determining tumour type by using the most minimally-invasive procedure possible to then outline the next appropriate stage of management.

Research Project

Aside from the day-to-day clinical aspect of this placement, I also spent a considerable amount of time working in conjunction with one of the specialty trainees on a research project on the topic of cervical collars.

Orthotic collars are commonly used to manage cervical spine injuries, both in the acute pre-hospital setting and as a definitive treatment strategy. Patients must be fitted with an appropriate and correctly sized orthosis to ensure adequate cervical immobilisation. This is to protect and prevent any injury of the spinal cord.

The study I worked on uses a new iPhone application (written and developed by our team) to objectively quantify the extent of movement reduction in the cervical spine whilst wearing different cervical orthoses.

We recruited 16 healthy volunteers with no previous spinal injury to test the new iPhone application. The iCollar application utilises the iPhone's inbuilt gyroscope to measure motion of the cervical spine. The iPhone is secured to the head and baseline measurements are taken of the maximum movement in three planes - flexion/extension, lateral flexion and axial rotation. The same data is then recorded whilst the participant is fitted with a Laerdal collar (sizes short, regular and tall) and an Aspen Vista collar (sizes 1, 4 and 6).

Our results showed a mean reduction in cervical motion using the Laerdal collar of 55.4% +/-13.8 SD (flexion/extension), 48.9% +/- 16.2 SD (lateral flexion) and 50% +/- 18.8 SD (axial rotation) $p<0.05$. The same data for the Aspen Vista collar showed a mean reduction of 48.6% +/-21.1 SD (flexion/extension), 27.6% +/- 16.9 SD (lateral flexion) and 37.4% +/- 21.1 SD (axial rotation) $p<0.05$.

When comparing an optimally-fitted vs. poorly fitted collar (across all planes) the mean reduction with the Laerdal was 57.8% +/-12.8 SD vs. 44.3% +/- 13.3 SD and for the Aspen was 45.1% +/-20.1 SD vs. 29.9% +/- 14.9 SD ($p<0.05$).

The mean difference between a correctly and incorrectly sized collar (across all orthoses) was 28.4%, SD= +/-9.7 (flex/ext), 33.9%, SD= +/-8.1 (lateral) and 36.1%, SD= +/-14.5 (rotation).

This study shows that there is significant variation in cervical spine range of motion between differently branded and sized cervical collars. The iCollar application is able to distinguish this variation and can objectively quantify cervical motion to ensure optimal motion restriction is achieved when using an orthosis. This application can therefore be used effectively to identify poorly fitting cervical collars.

This study has been submitted for presentation at The Society of British Neurological Surgeons biannual meeting in autumn of 2015.