The 2020 BOA Soli Lam Travelling Fellowship Report (USA)

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Executive Summary

On the 4th February 2020, I embarked on a two-month travelling fellowship to the USA, sponsored by the BOA and the estate of the late Mr Sorab (Soli) Jamshed Sorabsha Lam. I used this opportunity to further my deep interest in spinal surgery and visited a number of notable centres of excellence, including Columbia Children's Hospital of New York (CHONY), Mount Sinai Hospital, Thomas Jefferson University Hospital and the Shriners Children's Hospital of Philadelphia. I was able to observe cases and attend clinic with Drs Lawrence Lenke, Mike Vitale, Baron Lonner, Alex Vaccaro, Josh Pahys, Steven Huang and Amer Samdani, all of whom are key opinion leaders in the field of Spinal Surgery.

I returned to the UK on the 14th March after the remainder of my trip was cut short by the COVID-19 crisis. Despite missing the opportunity to visit Dr James Sanders and attend the AAOS meeting, this travelling fellowship not only fulfilled my educational needs, I was also able to gain a fantastic insight about the US healthcare system and create a network of professional contacts I am sure will be of significant value to me and my patient's in the future.

I not only wish to thank the BOA and the estate of Mr Soli Lam, but also my wife, Marilena, for her unwavering support during this time, and throughout my training. Thank you!

Introduction

I was deeply honoured to have received the 2019 BOA Soli Lam Travelling Fellowship Award for spinal surgery. These awards are made each year in memory of the late Mr Sorab Jamshed Sorabsha Lam, a senior Trauma & Orthopaedic surgeon who was based at Bromley and Tunbridge Wells. Alongside his practice in orthopaedic surgery, Mr Lam held a deep interest in spinal surgery. He was a member of the British Scoliosis Society and was interested in the management of paediatric spinal deformity, an area of practice I am particularly focused on developing.

With the backing of the British Orthopaedic Association, and support from my mentor, Mr Peter Millner (British Scoliosis Society President), I took the time to visit two centres in New York City and two in Philadelphia, before the COVID-19 crisis required me to curtail my trip. In total, I spent six-weeks learning from some of the foremost leaders in spinal surgery and I will be forever grateful to them and the British Orthopaedic Association for affording me this opportunity.

New York City: 4th February – 1st March 2020

Placement 1: Dr Laurence Lenke

My first stop was with Dr Laurence Lenke, of the New York-Presbyterian OCH spine hospital and the Morgan Stanley Children's Hospital of New York (CHONY), which are both affiliated to Columbia University.

As many will already know, Dr Lenke is leading academic in spinal surgery and world-renowned for the surgical treatment of both paediatric and adult patients with the most complex of spinal deformities. His eponymous classification of curve-types in adolescent patients with idiopathic scoliosis has become the gold standard system used world-wide. His work inspired me and many others to strive for excellence in the treatment of spinal deformity, so with this in mind I felt privileged to have been able to observe his clinical practice in clinic and theatre first-hand.

In clinic, we saw a large number of complex primary and revision cases. He was meticulous in his approach to dealing with these conditions, taking the time to breakdown the clinical problem into simple parts, which allowed him to devise a surgical strategy that was specific to each patient.

One memorable case we reviewed together was a young patient with Neurofibromatosis Type 1 who had a sharp angulated 130-degree kyphoscoliotic deformity in the cervico-thoracic region that was causing spinal cord compression without myelopathy. He described his personal experience dealing with such challenging cases and how he has become increasingly reliant on an extended period of pre-optimisation using halo-gravity traction, which is as archaic as it sounds. As well as increasing curve flexibility, it has been shown to improve respiratory function and weight gain whilst the patient is awaiting surgery. In addition, it appears to be relatively well-tolerated and can turn a deformity that would otherwise require two or three different surgeries, into one that can be treated with a single posterior-based approach. In this case, the post-operative result was the best one could hope for, with an almost complete restoration of normal sagittal and coronal alignment, along with preservation of neurological function.

In theatre, I saw a number of extremely interesting cases, including two vertebral column resections (VCR) and a number of revision cases. Traditionally performed using both an anterior and posterior approach, a VCR can be associated with significant morbidity, yet the technique is an effective way to address the most severe sagittal and coronal plane deformities. To make this procedure safer to perform, Dr Lenke was the first to describe an all-posterior decancellation technique which I was privileged to have been able to observe during my time there. One of the VCR procedures was performed in a child with a 103^0 thoracolumbar kyphosis in association with VATER syndrome. I learnt that the keys to success include judicious haemostasis, use of magnification and a slow and methodical reduction of the deformity.

Another observation I wish to share was Dr Lenke's use of life-sized 3D printed models of the spine (Fig 1). These were of exceptional quality and made the pre and intra-operative assessment of complex of spinal deformities really simple to do. By draping these in clear sterile bags, it becomes possible to maximise the utility of 3D imaging in cases with mixed coronal and sagittal plane deformities that cannot be fully appreciated on a computer screen.

I had the opportunity to visit CHONY on a number of occasions and took the opportunity to also attend theatre with Dr Michael Vitale, another respected leader in paediatric spinal deformity, and observed a posterior

instrumented fusion of a relatively typical patient with adolescent idiopathic scoliosis. Whilst this is a procedure I've routinely been exposed to during higher surgical and fellowship training here in the UK, I still learnt a huge amount about differences in surgical technique and decision-making philosophies. Uniquely, Dr Vitale routinely cannulates pedicles using a flexible, blunt-tipped drill bit that is designed to self-centre within the pedicle's cortical channel. Provided an accurate entry point is obtained, the technique appears both safe and reproducible, whilst minimising physical stress to the surgeon that can often be encountered when using traditional gear-shift type pedicle probes. In addition, we discussed the role of adjuncts to improve spinal flexibility in severe curves. The prevailing view amongst the surgeons I visited was that in their experience, posterior column osteotomies (a.k.a Ponte osteotomies) offer the ability to better correct stiff deformities without the additional morbidity associated with anterior release or costoplasty procedures. In fact, Dr Lenke specifically mentioned he had not found an indication for an anterior release in over 20 years, although other factors such as high implant density and more frequent use of in-patient skeletal traction may also play a part.

If I take one thing away from this visit, it is the importance of building a great team. Dr Lenke was surrounded by incredible staff and researchers, many of whom I spoke with to learn what it was that inspired them to work as well as they did together. They were all driven by the desire to provide excellent patient care and had a clear understanding of one another's roles, which was enhanced by the fact that they regularly (if not always) worked with one another in "Team Lenke," making the process of teamwork much more efficient and effective.

Placement 2: Dr Baron Lonner

Whilst in New York, I also took the opportunity to visit Dr Baron Lonner at the Mount Sinai Hospital. This placement was intended to provide me with an introduction to Anterior Vertebral Body Tethering (AVBT), a procedure akin to applying a flexible 'internal brace' to the spine to correct scoliotic deformities by exploiting the Hueter-Volkmann Law.

The paucity of robust clinical evidence means that AVBT is not commissioned by NHS England currently, yet many surgeons in the UK, and indeed around the world, recognise the potential benefit this procedure may offer skeletally immature patients with progressive curves that fail bracing and would ordinarily go onto require surgical fusion. In addition, parents and patients are increasingly interested in discussing the merits of AVBT, some of whom from the UK have expressed an interest in travelling abroad for treatment.

Dr Lonner is one of a small number of pioneers in anterior-based, minimally invasive and thoracoscopic-assisted "fusion," therefore his transition to AVBT five-years-ago seemed only natural after some of the early published studies demonstrated that it may offer carefully selected patients the ability to avoid a fusion, at least in the short-term. He has since amassed a series of nearly 300 patients, and I was fortunate to have observed four AVBT procedures during my time at Mount Sinai.

Like many of the American surgeons I visited, Dr Lonner took a meticulous approach to collecting prospective data for a number of concurrent local and multicentre research projects. He was well supported with a dedicated research assistant, as well as his close affiliation to the hospital's academic sciences centre, from which both basic science and clinical studies could be coordinated. Data collection was so well integrated into their standard clinical processes that it hardly took any additional time. By way of an example, I was shown a simple to use and relatively inexpensive hand-held pulmonary function testing device that can provide objective data about the effect a particular deformity, or the resulting surgery, can have on underlying lung function. This is of particular importance when considering AVBT as a surgical option due to the thought that the procedure could detrimentally affect pulmonary function in the longer term. Measurements took seconds, and the results were prospectively inputted into the patient's electronic patient record and research file. Integrating prospective data collection into a normal clinic workflow is hugely beneficial and something I really would aspire to put into practice as a consultant here in the UK.

My experience in the operating theatre was really insightful from the point of view of understanding the set-up, approach and technique. More so, however, was value of seeing new and follow up patients in clinic, where I really was able to make a more informed judgement about the technique's merits and limitations. During our time together, we had a great number of opportunities to discuss cases, which I really benefited from. The lessons I came away included the importance of careful patient selection and management of patient expectations.

Outside of work, I kept myself occupied by walking literally 'everywhere.' I don't think my step count has ever been higher! With my DSLR camera slung across my back, I made sure to make the most of the countless photo opportunities around the city. I sincerely hope to go back to visit New York in the not too distant future.

Philadelphia: 2nd – 14th March 2020

Placement 3: Dr Alex Vaccaro

Philadelphia is famous for many things, not least it's "cheesesteaks," famous "Rocky" statue and declaration of independence! It is also home to the Rothman Orthopaedic Institute, based at the Thomas Jefferson University Hospital, where I was fortunate to visit next.

My host was Dr Alex Vaccaro, infamous within the world of spinal academia having brought to the fore the Thoracolumbar Injury Classification System (TLICS), as well as numerous AOSpine classifications that are used in day-to-day spinal practice.

Uniquely, he was the first surgeon I visited with a Masters of Business Administration (MBA). I've often enjoyed reading business-related books in the past and one of things I really liked observing was how Dr Vaccaro managed his own practice, as well as the organisation he led. He literally oozed positivity and it was incredible to see how that empowered and elevated his whole team. By way of example, his clinic was run with the kind of efficiency you'd expect of Toyota, with up to five patients brought into rooms simultaneously for pre-checks (e.g. height, weight and clerking, as well as putting up electronic notes and imaging) before Dr Vaccaro was brought into the room. This team-approach to patient care meant that 100% of his focus was on maximising his interaction with his patients. In other words, he was able to provide high quality care at a consistently high volume with the use of 'lean processes' and 'just in time' concepts.

Theatre days were incredibly fun and insightful too. I joined the fellow and resident as they confirmed consent at 5:30am! Dr Vaccaro arrived by 6am, and knife-to-skin was consistently achieved by 6:30am. One of the most impressive aspects to how he ran his practice was the use of 'parallel' theatres. His fellow was responsible for one, while the resident was responsible for the other. Physician assistants were available for additional assistance where required. Dr Vaccaro continually switched between the two theatres during crucial stages of the operation, offering the opportunity for his trainee to gain some 'independent' operating experience, whilst maximising the throughput of patients and minimising "the empty theatre."

I will forever remember my time spent at Jefferson and aspire to create a similar environment for my clinical team to thrive and help deliver world-class care to our patients in the UK.

Placement 4: Dr Amer Samdani

My fourth, and sadly my last, placement in Philadelphia took me to the Shriners Children's Hospital of Philadelphia, which is part of a network of 22 non-profit medical facilities across North America providing orthopaedic, burns, spinal cord injury care *regardless of the patient's ability to pay*. Until this point, my experience had predominantly been within private medical facilities, so it was really refreshing to see the equally amazing facilities and high level of clinical care that this charitable institution was able to offer.

I was kindly hosted by Dr Amer Samdani and his partners, Drs Josh Payhs and Steve Huang. All three specialised in the treatment of paediatric spinal deformity, although unlike UK spinal deformity practice, two originally trained as neurosurgeons (Drs Samdani and Huang), and as a group they have been prominent leaders in the development and research behind 'fusionless' paediatric deformity correction – AVBT. During my visit, I also had the opportunity to present some of my own research from the UK, I was made to feel incredibly welcome by the whole team.

During my placement, the seriousness of COVID-19 gradually started to become more apparent. Thankfully, I still managed to get through the week with an opportunity to attend theatre cases and clinic with all three attending surgeons. I learnt about their indications for AVBT surgery, and how those have evolved with greater experience. The key point is that intervention should be carefully timed so that it is provided neither too late (lack of growth modulation), nor too early (over correction). Their series has yielded some notable successes, but in equal measure much of our discussions centred around the limitations of the technique. Picking that

'sweet spot' in timing is extremely challenging, as is the unpredictable effect treatment of a major curve has on any compensatory curves above or below.

Furthermore, as I learnt more about AVBT during my travelling fellowship, it became clear to me that 'fusionless' surgery by no means represents a 'cure.' Motion may be slightly better than a fusion, but the spine certainly does not function 'normally' and the ability of the technique to correct the deformity is much less predictable. Patients are consented for the fact that the need for a return to theatre is much greater in the short to medium-term, which was another useful insight.

Now having had the opportunity to observe the whole patient pathway, from clinic through to surgery and eventual outpatient follow up, I now feel better able to give a balanced view on the subject of AVBT surgery with my patients in the UK.

I returned back to the UK on the 14th March 2020, two weeks earlier than planned due to further escalation in the COVID-19 crisis, which had already resulted in the cancellation of the AAOS meeting I was planning to attend at the end of my trip. I missed the opportunity to visit Dr James Sanders, the 'god-father' of early onset scoliosis, based in North Carolina, as well as Dr Peter Newton at RADY Children's Hospital, San Diego, who had also kindly agreed to host me had it not been for the fact that tighter restrictions on travel and visits were coming into place.

I can only consider myself lucky for having been able to complete six weeks of a truly eye-opening and inspiring travelling fellowship. I owe the BOA, as well as the estate and family of the late Mr Soli Lam, a huge debt of gratitude for affording me this once in a lifetime opportunity. Finally, I must also thank my incredibly supportive wife, Marilena, and daughters, Evanthia and Iliana, for allowing me to take full advantage of this once-in-a-lifetime opportunity.

Photos:

Fig 1. 3D printed model of congenital spinal deformity

Fig 2. Attending clinic with Dr Lonner at Mount Sinai Hospital

Fig 3. Attending an evening event at the Union League of Philadelphia with Drs Alex Vaccaro and Chris Kepler from The Rothman Institute. Joined by Italian Travelling Fellow, Dr Andrea Vacchiano.

Fig 4. Lobby of the Sheiners Children's Hospital, Philadelphia

Fig 5. Personal photography – Manhattan Skyline, early morning

Fig 6. Me standing next to the famous "Rocky" statue at the base of the Philadelphia Museum of Art