[5] Rolleston J. The history of the acute exanthemata. London: Heinemann, 1937; 32–46.
[6] Ingrassias JP. De tumoribus praeter neturam. 1552. Tract 1, Cap 1.
[7] Diemerbrock I. Treatise of the Small-Pox and Measles. Translated from the Latin by Salmon WS. London: Edward Brewster, 1689.
[8] Morton R. Operum Medicum. Tomus Tertius de Febribus Inflamoriis Universalis. Amsterdam: 1699.
[9] Heberden W. On the Chicken-Pox. Transactions College of Physicians 1768; **1:** 427–41.
[10] Buchan W. Domestic Medicine. 1769.

FIFTH YEAR STUDENT ELECTIVE: REPORT TO THE MYRE SIM BEQUEST COMMITTEE

Aravind Eye Hospital, South India

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India has a great deal to offer an elective student. The subcontinent provides a fascinating mixture of culture, politics, history and geography, which invites the visitor to explore. As for medicine, there is perhaps as much pathology to be seen in railway stations and on the local bus as there is in the hospitals. I chose to spend my elective in Tamil Nadu, the most southern state of India, where the people are of Dravidian origin (as opposed to the Indo-Aryans of the north) and Hinduism is the predominant religion. I was based at an eye hospital in the bustling city of Madurai, one of India's oldest cities which for centuries has been a centre of learning and pilgrimage. The majority of the one million population are found on the south bank of the great Vaigai River which runs through the city. Here in the old town the famous Shree Meenakashi Temple, a formidable example of Dravidian architecture, draws thousands of visitors daily, and streets are alive with hawkers, beggars, rickshaws and motor vehicles.

Aravind Eye Hospital

This is tucked away on the north bank of the river where life is less crowded if just as hectic. Aravind is actually a group of four hospitals. Two of these are in Madurai itself and the other two are satellite hospitals in the nearby towns of Tirunelveli and Theni. The two hospitals in Madurai lie side by side; one is for paying patients and the other provides free treatment for those who cannot pay. These hospitals have between them 1,400 beds and serve a catchment population of 20 million, making Aravind the largest hospital for eye diseases in the world.

The pace of work inside the hospitals in Madurai echoes that on the streets outside with formidable results. Since its foundation in 1976, over four million patients have been examined and more than 500,000 operations have been performed.

The hospital began as a 20-bedded clinic. It was founded by Dr Venkataswamy, now in his eighties, a man of remarkable vision. As an ophthalmic surgeon, he was well aware of the alarming rate of blindness in India. Nearly four-fifths of India's 800 million people live in rural areas, where treatment for eye disease is not always readily available, poverty is common and the average labourer cannot afford to forego a day's wage to travel to the nearest clinic. Blindness brings a heavy burden to the families of those affected; a person who cannot see to work is no longer a source of income and becomes an extra mouth to feed.

The tragedy is that so often blindness among these people could have been reversed if treated in time. As cataract remains the chief cause in adults, many cases are correctable by surgery.

Dr Venkataswamy recruited the help of his family in an effect to combat this 'needless blindness' in South India and to run the clinic effectively. His brother gave up a prestigious government job to become manager of the hospital and

other siblings who were ophthalmologists helped with the surgery. Gradually, through unfailing commitment and determination, the hospital slowly expanded and by 1982 it had grown to occupy a 5 storey building with 250 beds.

In India, hospitals fall into two main categories: government hospitals, funded by the state, and those relying on outside funds. The latter include the Christian Mission hospitals, which are widely dispersed throughout India, and hospitals which function under trusts. Aravind is funded by the Govel Trust, a non-profit charitable organisation founded by Dr Venkataswamy in 1976. Donations are received from a number of American organisations, particularly those involved in research, and also from the UK. In addition, the income from fees received in the paying hospital from patients who can afford them funds treatment in the free hospital for those who cannot. In this way, the hospital is self-supporting and eye care is available to all.

Dr Venkataswamy's family has extended since 1976 and the next generation and their spouses now form the majority of the senior surgeons. Aravind also employs a large staff of younger doctors and nurses, together with administration staff. There are also receptionists, librarians and technicians who work in the resource centre which now houses 15 computers.

Training for the young doctors is vigorous and working hours are long; operations begin at 7.30 am and clinics go on until 6 pm or later if patients continue to arrive. Aravind follows the American system of hospital hierarchy and the younger doctors refer to their 'resident training'. The residents are proud of their positions at this renowned and respected hospital. They are highly motivated and think nothing of the long hours they work. The nurses at Aravind are also highly trained. They are young girls brought to Madurai from surrounding villages, where their fathers are too poor to furnish their dowries. The dowry system is still an integral part of Hindu culture and without it no girl can have an arranged marriage. These girls, or 'sisters', live in strictly-run lodgings nearby and are recognised by their graceful lilac saris which are spotlessly clean and impeccably pressed. They work at Aravind for four years, by which time they have earned enough for a dowry and may return to their villages. It is a system which has worked very well; the sisters work diligently and perform highly skilled tasks.

Aravind has specialists in a number of fields within ophthalmology. There are separate clinics for neuro-ophthalmology, retina and vitreous surgery, glaucoma, cataract, cornea disease, orbit and plastic surgery, and paediatrics. Clinics run daily for referrals and post operative cases and turnover of patients is high; over a six month period in 1993, 47,999 new patients were seen as out-patients. Cataract surgery forms by far the largest component of the workload. Patients with cataract are younger than those seen in the West and a high percentage have followed trauma.

Glaucoma and cornea surgery are also common, again the result of trauma. Corneal graftings are performed at Aravind as the Eye Bank of which Dr Venkataswamy is president has its headquarters here.

Diabetes is less common than cataract and glaucoma; of the 47,999 patients mentioned above, diabetes was diagnosed in 3.9 per cent. Of these, 53 per cent had cataract and 37 per cent had diabetic retinopathy. The paediatric clinic is particularly interesting. Conditions include buphthalmos of congenital glaucoma, congenital cataract and squints. Cases of retinoblastoma also present but sadly often do so too late for anything but palliative treatment. Of non-surgical conditions, infection, particularly causing conjuctivitis, is common but trachoma does not feature greatly. Bitôts spots and other manifestations of vitamin A deficiency are also seen. I saw one case of bilateral keratomalacia from chronic malnutrition, and cases of apparent bacterial keratitis in stunted and/or wasted children are sometimes referred to exclude keratomalacia.

The different clinics are ideal for elective students. With the high turnover of patients, a wide range of conditions can be seen and cases often present far later than would be seen at home. In addition to clinics in the hospital itself, vast numbers of people are screened in special outpost clinics which take place in surrounding villages. These 'eye camps' operate throughout Tamil Nadu and extend to the neighbouring state of Kerala. They take place mostly at weekends and ten or more camps are conducted each week. In 1993, 795 camps were conducted in Tamil Nadu and Kerala in which over 200,000 patients were screened. 24,291 operations were performed, mostly for cataract. The camps are sponsored by the Rotary Club, the Lions Club and other local charities and these organisations are responsible for advertising the camps when they are to take place. This involves distributing posters for those who can read, and driving around surrounding hamlets announcing the arrival of the camp with the aid of loud speakers. The news is then spread by word of mouth and anyone with a visual deficit or concerns about eye disease can come to the camp to be screened. The team sent out by Aravind consists of one doctor and three sisters who set out in a minibus to the village. There they set up a small clinic for the day in a school or village hall or equivalent. A camp visits the same village once to four times a year, depending on its distance from Madurai.

In the clinic, the sisters carry out refraction, tonometry and administer eye drops, while the doctor examines the patients. Prescriptions are written for treatment where possible or the patient is offered an operation. The team works tirelessly and over a period of four hours at least 150 patients will be seen.

Those requiring surgery, if willing (many will not come during the harvest season when work is plentiful) are taken back in the minibus to Aravind, where they are treated in the free hospital. (Fig 1) After surgery, the patients are taken back to their village. In places where there are a great number of cases, surgery camps are set up where operations are performed on site.

Surgery at Aravind is performed each morning, in both the free and the paying hospitals and 200–300 operations take place each day. Patient turnover is high because by the nature of ophthalmology, general anaesthesia is not necessary except for paediatric cases. A local anaesthetic is given retro-orbitally in a waiting area outside the operating theatres to induce temporary paralysis of the extrinsic muscles of the eye. Each patient is carried into theatre on a stretcher, operated on and then led to the recovery area on foot. A cataract operation takes a matter of minutes, the doctors working with astonishing speed, assisted expertly by sisters able to cut suture material a fraction of a hair's breadth with the naked eye.

There is no difference in treatment between the paying and free hospitals except that, in the former, intraocular lenses are fitted following cataract surgery. Patients in the latter must instead wear glasses with aphakic lenses.

The equipment used in the hospital is up to date to enable the best possible treatment. The doctors operate using biomicroscopes rather than loupes and

FIGURE 1

Patients after treatment at the free hospital.

ultrasonography is used to measure diameter of the eye in patients for intraocular lenses. Aravind now manufacturers its own intraocular lenses at a fraction of the price of those bought in Europe. Plans to export these lenses, which are of high quality, are being considered with a view to increasing hospital capital and allowing further expansion.

Post-operative patients are followed up the next day. The wards in the free hospital are large rooms with up to 40 woven mats on the floor as beds. This is all that is needed as the patients are not systemically ill. The paying hospital is slightly more comfortable for its in-patients but the principle is the same.

Aravind is certainly a unique place. The staff there have an attitude encountered in few other hospitals. The doctors seem genuinely devoted to their work and restoring sight among the masses appears to them a potentially attainable goal that they must strive for. The way the hospital has developed in under two decades is formidable and the impact on the local population is inspiring.

In spite of these achievements, however, Dr Venkataswamy is far from complacent and he has plans for expanding further. His latest project is the building of a new institute for teaching and research to promote recognition of Aravind as a learning centre as well as one of surgical excellence.

Dr Venkataswamy's concern is that the growing demand for cataract operations is still not being met as the prevalence of blindness caused by cataract rises each year. He is keen for the Aravind 'model' to be adopted in other regions throughout India and ultimately more widely, in other parts of Asia and in Africa. He believes the answer is to standardise all equipment and methods in a similar way to franchises in the West. He uses the analogy of chains like Burger King arguing that they have been successful because they follow a simple set of reproducible guidelines to tackle the problem of increasing demand. Until it is possible to work on this scale, however, it is inevitable that blindness in India will continue to increase.

My elective in India was a profound experience. As a child, I had grown up hearing reports and stories about the country from a variety of sources around me. Opinions differed greatly between those of my father's generation, who had known India before Independence, and those of my own, helped by people who had grown up in this country, if they had not in fact been born here. Going to India myself was thus an opportunity to derive my own thoughts from what I was presented with. Strangely, I did not suffer from culture shock at any time. This could well have been the result of six years of study at the London Hospital Medical College in Whitechapel where the crowded streets and markets abound with the same rich variety of costumes and colour.

I was well prepared for the poverty I was to see, which is rife, and the bony cows which eat rubbish left at the side of streets. These aspects disturbed but did not shock me. What came as the biggest surprise was the warmth and kindness I encountered among the people. I met with nothing but courtesy throughout my time at Aravind and the doctors there were keen to teach. I was particularly lucky to have Dr Lakshmi Rahmathullah as my mentor as she educated me on aspects of Indian life in poor rural areas that one cannot obtain from books. I was able to visit tiny hamlets not mentioned on any map I had and witness primary health care in action at its most rudimentary.

I learned ways in which health care in the Third World could be optimised and it was inspiring to see these ideas not only in action but producing results. It is too often the case that such ideas are greeted with cynicism and any case for hope is quickly shrouded in gloom. When I set off for India it was with this gloom that I was expecting to return. I found myself instead coming back with a far more positive outlook than that with which I had left.

I feel I benefited greatly from the time I spent in Madurai. I am most grateful to the people at Aravind and very much look forward to visiting their country again.

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