We live in a world that is becoming too ready to litigate – and where healthcare is expensive and presents a large number of choices. All those children's cases in which we tried our innovative ideas represented a challenge to existing and universally accepted treatments. But each time we toy with a new idea, we need to ask whether it conforms to the framework of ethical and legal behaviour. Failure in our attempts to convert an idea into a successful action does not achieve the desired objective of progress in science; it also means that our idea was flawed. Moreover it endangers a life. Hence these errors need to be addressed if further mishaps and loss of lives are to be prevented.

Dissatisfaction with the inadequate and curiosity to innovate may be innate to the few. Maybe it can be inculcated in others by inspired teachers. But the great responsibility that comes with this -- of being able to keep the interests of the patient foremost, not personal glory, not even the progress of science -- requires the qualities of honesty, openness, willingness to share and discuss ideas, as well as the ability to give and take criticism, and accept failure with grace.

Our current medical education does not prepare us for this.

Perhaps early and continuous exposure during medical school training to the history of medicine, medical ethics and western and Indian literature with an undercurrent of these ideas will go some way towards preparing students. Medical teachers who are role models will have a huge impact in propagating these qualities among generations of students and doctors.

References

1. Castaneda AR. Classics in thoracic surgery. Patent ductus arteriosus: a commentary (Robert E. Gross). *Ann Thorac Surg.* 1981 Jan;31(1):92-6.
2. Koshy S, Shivaprakasha K. Novel repair for obstructed total anomalous pulmonary venous connection to coronary sinus. *Ann Thorac Surg*. 2005 Feb; 79(2): 711-3.
3. Shivaprakasha K. Simplified double barrel repair with autologous pericardium for tetralogy of fallot with hypoplastic pulmonary annulus and anomalous coronary crossing right ventricular outflow. *Ana Pediatr Cardiol.* 2008 Jan;1(1): 34-7. doi: 10.4103/0974-2069.41053.
4. Shivaprakasha K, Rameshkumar I, Kumar RK, Nair SG, Koshy S, Sunil GS, Rao SG. New technique of right heart bypass in congenital heart surgeries with autologus lung as oxygenator. *Ann Thorac Surg*. 2004 Mar; 77(3):988-93.
5. Gribbin J. *Science: A History*.2001; Penguin Books.p12.

Contemplating complications: living the experience, learning the lessons

RAVI RAMAKANTAN

Department of Radiology, Seven Hills Hospital, Marol, Andheri (East), Mumbai 400 059 INDIA e-mail: raviramakantan@gmail.com

Abstract

Complications related to the use of new diagnostic and therapeutic techniques are inherent to innovation in medicine. Appropriate consent should be obtained before subjecting patients to these techniques. In spite of doing this, when a complication does occur, one can easily relate to its devastating impact on the patient and his/her relatives. The toll that such events take on the treating physician also needs to be considered. The burden of conscience when a patient consents to such a procedure with implicit faith in the physician is immense.

A case of irreversible paraplegia due to non-target embolisation of the anterior spinal artery in a young lady undergoing bronchial artery embolisation for hemoptysis is discussed. A feeling of "sadness and guilt" and a scientific analysis of the cause for the adverse event result in changing the protocol of the procedure leading to increased safety for future patients. Wide consultation with colleagues and help from institutional review boards are useful in assuring the treating physician about the justification of performing such procedures and help in coping should complications occur.

The manner in which these events are managed, especially by medical teachers in teaching hospitals, is an important learning point for medical students and doctors in training. The need for appropriate open forums in institutions is emphasised, where such events are shared by physicians, resulting in unburdening themselves and potentially in education for all present.

Background

In 1982-83, my colleagues and I at the Department of Radiology, KEM Hospital, in Mumbai, started performing bronchial artery embolisations (BAE) for the treatment of massive haemoptysis, ie blood in the sputum, due to pulmonary tuberculosis. I had read the literature around this and realised that performing bronchial artery embolisation was fairly straightforward and could be done with the instruments, equipment and skill we had.

Before each intervention, we would explain the procedure to the patient. We mentioned the usual complications associated with femoral catheterisation. We added that if the procedure failed, we might have to redo it and if even that failed, an operation might be needed to remove the affected lung. From my reading of the literature, I did not think that any other complication was common enough to merit explanation to the patient or the patient's family. As many of these patients had presented to us in the emergency, and most patients were deeply disturbed by the hemoptysis, almost all patients readily consented to undergo the procedure.

In a couple of months, we had successfully embolised and treated about half a dozen of these patients with good results and without incident.

At this time, we let our resident doctors perform these procedures under our supervision (I was a lecturer then). This went on for a few months and the procedure became a standard of care at our hospital.

Case report

The following incident occurred about a year after this.

The patient was a young woman between 25 and 30 years of age. She had presented to the casualty with 300-400 ml of haemoptysis. As per our protocol, she was taken up for embolisation around 8 pm. As the resident started doing the procedure, I stood behind, guiding him. The procedure was performed under local anaesthesia by retrograde femoral catheterisation. The embolisation went off uneventfully and was completed in about 45 minutes. When we removed the sterile sheets off the patient, my resident asked the patient to lift her legs so the blood at the femoral puncture site could be cleaned off. She said, "I am not able to move my leg." I heard the patient say that – but did not pay much attention until the resident came into an adjacent room a few minutes later and told me, "The patient seems to have developed paraplegia."

I went in to examine the patient. She was indeed paraplegic with power zero in both lower limbs - from hip to toes. The sensations in her lower limbs seemed impaired. I vividly remember noticing the over-distended bladder in the lower abdomen and when I asked her if she wanted to pass urine, she said, "I do not feel like it," which was the opposite of what most patients who have just undergone angiography usually say. I then slowly realised that she had lost bladder sensations, too. I was deeply worried by this. I immediately understood what could have happened: inadvertently, we seemed to have embolised the spinal artery. I then reviewed the images and though we had embolised a common intercosto-bronchial trunk, I could not see any spinal artery arising from this. My colleague from neurology examined the patient and confirmed that the patient's clinical findings were indeed due to anterior spinal artery (ASA) occlusion. He suggested giving methyl prednisolone. It was very expensive in those days and as the patient could not afford it, she was instead given a high dose of dexamethasone - for what it was worth. I talked to the patient as she lay on the table and told her that in a few days she should be getting better. After urinary catheterisation, we sent her to the ward. Her husband was waiting outside the cath lab. I explained to him what had happened, and that we did not know how long it would take for her to recover. He did not seem agitated by this, said something like: "It will become alright, no?" to which I gave a non-committal reply.

The aftermath

I recall being completely shattered by this incident. I was travelling home that night by a public transport bus at 11 pm. I was so deep in thought that I missed the stop at which I was to alight. I had trouble sleeping that night and was back at the hospital early the next morning to examine the patient, hoping for a dramatic improvement. That was not to be. The patient's neurological status remained unchanged; but, the haemoptysis had ceased.

When I discussed the patient and her angiographic images with my seniors in the department later that morning, they were very supportive. They said that the ASA could not be seen on the angiograms even in retrospect and that they too would have done the embolisation as we had. But, that was no comfort.

Later that day, reading extensively on this, I learnt that paraplegia was a well-documented but very rare complication of BAE, with no specific treatment recommended. And the recommended technique was not to embolise any vessel with a suspect ASA arising from it.

Over the next few days, when I visited the patient in the ward, I realised that though there was no improvement, the relatives seemed to have accepted this complication. The patient herself was just anxious to get home. I remember her being in the wards for about two weeks. The power in her lower limbs had improved minimally but the sensations had returned to normal. She, however, continued to have retention of urine. The last I remember seeing this patient on follow-up was about six months later, when I ran into her in our physiotherapy department. She was walking with support and had Grade 3-4 power in the lower limbs. The bladder remained paralysed.

Ironically the patient and her husband seemed grateful that she was improving.

After this complication, we changed our protocol during BAE. We would closely analyse the images to look for ASA and especially if an intercostal bronchial trunk was present. We would carefully rule out the presence of an ASA. We would also constantly monitor the patient for power and sensations in the lower limbs throughout the procedure. The patient was also told to report immediately if he/she felt heaviness or numbness in the lower limbs.

Thinking back

In my career as an interventional radiologist, I have had my fair share of complications, both major and minor. Some required urgent surgical treatment and others resulted in disability and death - especially in interventional procedures involving the brain. So I wondered why this particular complication, a non-fatal one which occurred almost 30 years ago, strikes me as being the most poignant.

It is not as if we have not performed "first-time" procedures in our department, based mainly on reading the literature, or by improvisation using available resources. Occasionally these too have resulted in complications.

Viewed against this background, our performing the first bronchial artery embolisation based merely on our experience of vascular catheterisation and intervention was not unusual. I had discussed performing BAEs with three of my colleagues and the predominant question was: "Can we do the procedure-do we have the skill?" The answer was a unanimous 'Yes'. We felt that the worst that could happen was that we would fail and the patient might need surgery. I do not recall actively discussing paraplegia as a complication of this procedure. Also, since no one else we knew had done this procedure, the question of seeking others' advice in the matter did not arise.

So what was so different about this patient? The difference strikes me very clearly. In almost every other complication,

the patient had been cautioned about the possibility of an untoward event – for example in interventions on the brain, death or irreversible neurological deficit is explained as a small but real possibility.

The complication in this patient was unrelated to the disease that the patient presented with. She was a young lady in the prime of her life, trusting herself to us to treat a "simple" disease such as TB and a not really life threatening symptom such as haemoptysis. She walked in to the angio suite, climbed up on the table herself and should by rights have walked home in a day or two, completely cured of the disease. Instead, she developed a permanent disability. Worse, neither the patient nor her relatives nor we were prepared for such a complication. It was as if we had short-changed the patient.

There was the additional guilt that neither the patient nor her husband really blamed us for the complication. The fatalism with which they accepted it was humbling. I wondered: Were we using our patients as guinea pigs?

Given the fact that no spinal artery could be seen, we seemed to have exercised reasonable care in examining the films. However, if we were aware of the possibility of paraplegia, we would have clinically monitored the patient and this could have reduced the morbidity in this patient. To me, this appears to be the greatest failing in this case. And so this case troubled me then, and troubles me still, in spite of assurances from colleagues and seniors in the department; and a part of my own brain telling me that it was not my "fault". And, then the issue of patient consent.

Patients visiting large teaching hospitals in Mumbai and elsewhere in India are usually from the lower socio-economic strata of society and cannot afford healthcare costs elsewhere. It is often difficult to explain to these patients the technical details and consequences of such procedures. They come to the doctor with implicit faith that he or she will do no harm. And when we do seek consent for a procedure such as the one in this case, it is very common for the patient to say: "Do what you feel is right; you are like God to us." Though we are so used to hearing these words and take them for granted, this in no way diminishes the great responsibility that it puts on doctors – namely, to think for and act on behalf of the patient and her family. It may also be possible that this implicit faith is a reason why patients are often so forgiving when complications occur, as happened in this case. In such a context, when things go wrong, the whole 'burden of conscience' weighs heavily on the physician obtaining consent and performing the procedure on the patient. I have never been able to determine for myself whether such blanket trust and faith are good for the patient, or even for the physician.

Thankfully, however, in the last 15-20 years, we have our ethics and institutional review boards in place. These often act as checks and balances preventing gross misadventures or at least providing the institutional support of many minds in carrying out new and innovative procedures on patients. These help us put in perspective the interests of patient care and the need for medical research and progress.

In the case of BAE procedures that we had performed, the first half-dozen or so were uneventful and successful and this emboldened us to perform them as a matter of routine. It is interesting to speculate on the impact of complications in such initial procedures. If complications occur early on in our experience with such new techniques, they could result in the procedure being abandoned or lead to greater thought, greater caution and review of the technique itself. The initial and overall success of this procedure helped us spread this technique with optimism throughout the country; while this complication helped us emphasise the need for unwavering caution at all times while performing BAE.

Impact

In the 20-25 years since this complication, we have performed hundreds of BAEs and I recall at least five more such complications, each recognised in time before complete embolisation, and each of these patients has recovered more or less completely.

What impact do these complications have on physician performance? Do they have long term adverse effects? In my own case this and similar cases have had no short or long-term negative impact on my performance as a radiologist. Even in the days around this complication, my ability to work on other patients remained unaffected. However, these cases do provide long term education and temper one's practice. A search of the PubMed database does not reveal a single other report of a similar nature from a radiologic practice point of view. However, there are many reports from other specialities that show impact on physician performance after such incidences (1, 2). Obviously, physicians need to be encouraged to share these instances not only for their medical importance, but also as a method of unburdening themselves. In fact, such activities need to be institutionalised (3).

In our country, instances such as these bring into sharp focus the reasons why we should be eternally grateful to the patients who visit teaching hospitals for treatment. Often, they unquestioningly submit themselves to our care and, even under adverse circumstances, do not question our judgment. Thus, well beyond medical care, the burden of responsibility for the overall well-being of the patient falls on the treating physician and this burden can be immense. These provide rare but invaluable opportunities for the medical teacher to teach medical students and doctors-in-training, both by precept and by practice, how best to shoulder these dual roles – the easier one of being the treating physician, and the more difficult one of being forced to think and decide for the patient and his family.

References

1) Gazoni FM, Amato PE, Malik ZM, Durieux ME. The impact of perioperative catastrophes on anesthesiologists: results of a national survey. *Anesth Analg*. 2012 Mar;114(3):596-603.
2) Bernhardt BA, Silver R, Rushton CH, Micco E, Geller G. What keeps you up at night? Genetics professionals' distressing experiences in patient care. *Genet Med*. 2010 May;12(5):289-97.
3) The Schwartz Center for Compassionate Healthcare. When caregivers grieve. Schwartz Center Rounds [Internet]. [cited 2013 Apr 9]. Available from: http://www.theschwartzcenter.org/viewpage.aspx?pageid=51