Rural medicine

Management of paediatric head injury in remote Nepal

Tom Mallinson

Medical Teaching Centre, Warwick Medical School, Coventry, West Midlands, UK

Correspondence to Tom Mallinson; tom.mallinson@doctors.org.uk

Summary

Soo Jung Hospital in Doti, Far-Western Nepal is a small district hospital founded in 1994 and run as a private hospital with support from charity donations. It is staffed by two doctors, and two health assistants, supported by a team of nurses and nursing students. Approximately 50 people are seen as outpatients each day. There is a four bed emergency department and two inpatient wards which are able to accommodate 16 patients between them. Basic x-ray facilities are available, but for further imaging studies and surgical interventions patients must be referred to a tertiary centre, the nearest being 7–9 h away by road. Cases of major trauma must be managed with these limited facilities for prolonged periods of time. In addition to this, once a decision has been made to attempt an interhospital transfer, this is undertaken in a vehicle ill-equipped, or staffed, to perform medical interventions en route.

CASE PRESENTATION

On a weekday evening at 20:00 h in March 2012 (Chaitra 2068 in the Nepali Calendar), a 7-year-old boy, weighing approximately 22 kg, was brought to the emergency department (figure 1). The patient's mother reported that he had fallen approximately 2 m from the roof of his house onto concrete nearly 2 h before. He had been unconscious since the time of injury, there were no signs of seizure activity and he had not vomited. His family had been unable to revive him with cold water, and had subsequently brought him to the hospital. On examination, he was maintaining his own airway and cried in response to painful stimuli. He had equal bilateral air entry with no added sounds and no signs of respiratory compromise. His respiratory rate was 32/min with an SpO₂ measurement of 99% on room air. Oxygen therapy was initiated using an oxygen concentrator driven by mains electricity, at 5 l/min via nasal cannula (the highest flow rate available), however this was discontinued after a short time due to power shortages. Arterial blood gas analysis was not available. Peripheral pulses were all palpable

at a rate of 107 beats/min (bpm). Equipment to obtain a blood pressure reading was unavailable. No evidence of otorrhoea or rhinorrhoea were found. His Glasgow Coma Score (GCS) was found to be 9/15 (eyes 2, verbal 2, motor 5). His pupils were equal, 5 mm in diameter and responsive to light. He had spontaneous movement and normal power in all four limbs, with occasional abnormal flexion to his arms. Plantar reflexes were normal. His abdomen was soft and non-tender with no visible ecchymosis. Capillary blood sugar was 9.4 mmol/l. Intravenous access was gained and an infusion of Ringers Lactate was started as a maintenance fluid. A lateral skull x-ray was obtained which showed no evidence of fracture and a urethral catheter was inserted. It must be noted, however, that the quality of the radiograph was limited due to the basic facilities at the hospital (figure 2).

Parental movement of the child and periodic agitation of the patient hindered immobilisation of the spine. The patient's head was elevated by approximately 20° by raising one end of the bed. Neurological observations were recorded every 15 min on a newly introduced Neurological

Figure 1 Emergency department.

Figure 2 Radiography department.

Observation chart.¹ No facilities were available for appropriate sedation, anaesthesia or ventilation. The patient's relatives were advised that a CT scan was required and that the patient would be best managed in a hospital with additional resources. The patient's mother decided that she would rather wait and see how the patient's condition changed overnight, and make a decision in the morning. This decision appeared to be influenced by the high cost associated with transportation (either by 4×4, bus or ambulance) and by the unfortunate occurrence of a road block that day, which was anticipated to significantly delay transfer of the patient.

One hour after admission (at 21:00 h) the patient was found to have an upgoing plantar reflex on the right side, his heart rate had fallen to 90 bpm and his GCS remained stable and serious at 9/15. The pupils were still isocore and reactive at 5 mm, facilities for funduscopy were not available. He was administered 100 ml of 20% mannitol intravenously in an attempt to lower a probable raised intracranial pressure. Overnight the patient's observations remained stable, he continued to receive maintenance fluids and intravenous dextrose as he was unable to take food orally.

At 9:30 h the next day, his GCS was 8/15 (eyes 1, verbal 2, motor 5) and both plantars were found to be upgoing. Both pupils were 4 mm in diameter and sluggish. The right pupil showed marked lateral deviation. This was thought to be due to compression of the oculomotor nerve as a result of an enlarging intracranial mass and possible uncal herniation. Due to continued power shortages, the patient had not been receiving supplemental oxygen overnight and had an SpO₂ reading of 94% on air. Over the next 3 h the patient's condition remained stable, with his GCS fluctuating between 8 and 9. The appropriateness of a second dose of mannitol was discussed, but was decided against for fear of causing rebound cerebral oedema. At approximately 12.30 h the patient left the hospital for Dhangadhi, 7–9 h away, as this was the closest CT scanner. Maintenance fluids were continued during transport. Diazepam was also prepared and instructions were given to the ambulance driver on how and when to administer this if seizures occurred. No other facilities were available in the ambulance to provide further interventions and oxygen therapy could not be continued (figure 3).

OUTCOME AND FOLLOW-UP

Over the next 4 days the patient underwent further assessment and management. He underwent CT scanning in Dhangadhi which identified a substantial intracranial haematoma. He was then transferred by ambulance and rickshaw across the border to India, where he underwent surgical evacuation of the haematoma. Initially the surgery appeared to have been successful. However, after 1 day on the intensive care unit the patient died (6 days after the initial injury). It is believed that death was due to respiratory failure, possibly secondary to further haemorrhage. Specific details of the cause of death, or type of haematoma are unavailable.

DISCUSSION

This case report hopes to highlight the general difficulties of managing a paediatric patient with a severe head injury in a remote, under-resourced setting and to draw attention to a number of specific problems encountered in rural Nepal. It is clear that this patient did not receive the standard care which he would have received in a more developed region or country. Furthermore, the patient's life may have been saved if he would have received a higher standard care from the point of injury.

The clinical presentation of this patient certainly fulfilled the criteria for immobilisation of the cervical spine.² However, due to lack of equipment, uncontrolled patient movements, parental repositioning of the child and the lack of appropriately trained clinical staff, this was not possible. Furthermore, although indicated, obtaining and interpreting an urgent CT scan for this patient was also not possible without incurring significant transfer time and expenses for the patient's family. It is estimated that the cost of transport to Dhangadhi and receiving the CT scan there would have been approximately Rs 6000. Onward transfer to India and subsequent surgery and intensive care was estimated to have cost around Rs 60 000. When one takes into account that the average monthly salary in this region of Nepal is Rs 5000, this is clearly a significant expenditure, with no guarantee of a successful outcome.

This patient may also have benefited from receiving invasive ventilatory support, adjusted to arterial blood gas analysis.² Unfortunately, blood gas analysis was not

Figure 3 Ambulance interior.

available, neither were facilities for appropriate anaesthesia and ventilation. At the less advanced end of the spectrum, the ability to obtain a blood pressure reading would have helped guide management, especially in this case of suspected raised intracranial pressure.²

This patient's case did provide an excellent opportunity to introduce a neurological observations chart to the hospital.¹ The use of this chart was introduced at the time of this patient's admission by the author and local clinicians were taught to fill in and interpret various aspects of the form under supervision. Prior to this, emergency patients had only received basic observations of vital signs, often sporadically, while in the emergency department. The use of this form was also encouraged for a number of patients in addition to this case, and it is hoped that this chart will continue to be used at the hospital for appropriate patients.

CONCLUSION

This case has highlighted the general lack of available medical resources in Far-Western Nepal. This is an important issue, which requires internal reform by the government of Nepal and not simply input from external aid agencies. This is especially true for the availability of suitable transportation options and the reliable supply of electricity to hospitals. It is hoped that the development of appropriate policies by the government in relation to capacity building and development of the health sector for rural areas will go some way to resolving these problems. Unfortunately, even once change

occurs centrally this will take time to benefit patients in rural areas.³

Currently, the Nepalese government struggles against political unrest, huge climatic variations, by season and geographical region and widespread communicable disease prevalence to provide healthcare to its inhabitants. Healthcare is funded by the private and public sector as well as overseas charities. Problems with healthcare provision are further compounded by the complex hierarchical health system, with various tiers of provision from Regional Directorates, Districts, Primary Health Centres, Health Posts and Sub-Health Posts. There is also widespread regional discrepancy in how funds are allocated and spent, there are also concerns regarding the proportion of funds reaching those most in need, either due to administrative issues, or inappropriate diversion of funds. This often leads to under-resourced and under-trained clinicians caring for a vulnerable population in a difficult environment.

This case report also accentuates the importance of clinicians in remote areas having comprehensive training in trauma management, especially in environments where tertiary services are not immediately available. In addition to the long term development needed, in terms of basic amenities and healthcare infrastructure, it would be appropriate to develop a sustainable national teaching programme for all clinical staff in rural Nepal. Ideally, this programme would cover the principles contained in courses such as Advanced Trauma Life Support, the Advanced Trauma Care for Nurses course and the Pre-Hospital Trauma Life Support course,⁴ possibly with

minor modifications to suit the local availability of services. This would be an area where more rapid change can be achieved; especially with appropriate input from international charities and aid agencies. It would also be beneficial to ensure that telemedicine support is available to all hospitals in remote Nepal, to allow rural physicians to consult with appropriate experts at a specialist hospital.^{5 6} It would be possible to implement a network of telemedicine support with minimal improvements to national infrastructure through the use of satellite phones, which run on rechargeable batteries. It would however be very difficult to provide any more advanced forms of telemedicine support until problems such as power shortages are addressed. These approaches would also facilitate the use of evidence-based medicine in rural Nepal, which is currently hampered by a poor communication network and relative isolation.

Learning points

- The assessment and management of patients in remote environments provide a myriad of challenges, which may sometimes contribute to the death of a patient.
- Organisational reform is required to provide a high level of care to patients in remote regions of Nepal.
- The work of charities and volunteers is currently essential to support local clinicians in their work, and to aid development of services in remote regions.

Acknowledgements The author would like to acknowledge the hard work of the staff and volunteers at Soo Jung Hospital, who have worked hard to keep the hospital running for many years.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **National Health Service.** *Neurological observation chart*. <http://www.patientsafetyfirst.nhs.uk/ashx/Asset.ashx?path=/ten2010/UHL%20neuro%20obs%20chart.pdf> (accessed 27 Apr 2012).
2. **Singer M, Webb AR.** *Oxford handbook of critical care*. 3rd edn. Oxford: Oxford University Press, 2009.
3. **Gurung G.** Nepal health sector decentralization in limbo: what are the bottlenecks? *Nepal Med Coll J* 2011;**13**:137–9.
4. **American College of Surgeons. The ATLS Program.** <http://www.facs.org/trauma/atls/about.html> (accessed 27 Apr 2012).
5. **Campana BA, Jarvis-Selinger S, Ho K, et al.** Use of telemedicine for an emergency craniotomy in a pediatric trauma. *CMAJ* 2012;**171**:444–6.
6. **Wagner A, Millesi W, Watzinger F, et al.** Clinical experience with interactive teleconsultation and teleassistance in craniomaxillofacial surgical procedures. *J Oral Maxillofac Surg* 1999;**57**:1413–18.

Copyright 2012 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Mallinson T. Management of paediatric head injury in remote Nepal. *BMJ Case Reports* 2012;10.1136/bcr-2012-006474, Published XXX

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow