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EDITORIAL

Anaesthesia in the wake of the Nepal earthquake

Experience and immediate lessons learnt

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A magnitude 7.8 earthquake struck Nepal on Saturday 25 April 2015 at 11:56 a.m. local time. The epicentre was located close to the city of Gorkha (Bardham). An early estimate of casualty numbers suggested 6000 dead and more than 15 000 injured.¹

The Swiss Agency for Development and Cooperation/ Humanitarian Aid deployed a Foreign Medical Team type 2 (http://www.who.int/hac/global_health_cluster/fmt_guidelines_september2013.pdf) 'Mother and Child'. The team's primary focus is on the mother and child population, including surgery, medicine, deliveries and caesarean section. Five days after the earthquake (Wednesday 29 April 04:00 p.m. local time), the team, which included two anaesthetists and basic equipment and drugs for performing spinal, loco-regional and ketamine anaesthesia, arrived in the District Hospital of Gorkha.

The local facilities and structure of this regional hospital were assessed by a Swiss engineer. One of the two operating rooms available was declared safe. Available upon arrival was a functional anaesthesia machine, halothane, oxygen in cylinders and monitoring. Owing to the scale of the destruction, the usual postanesthesia care unit was occupied by many surgically hospitalised patients. A Nepali nurse anaesthetist was present, although not continuously available for surgical activities because he was also in charge of the coordination of all emergencies within the hospital. In addition, a volunteer Nepalese anaesthetist from the west of the country was available for the first 2 days.

Surgery and anaesthesia

During the first week, many patients were encountered who had travelled long distances with signs and

symptoms of exhaustion, pain, infection and dehydration. During this week, the anaesthesiological, surgical and obstetrical workload of the Swiss and Nepalese team was 66 cases, including 43 orthopaedic (mainly related to the earthquake and including open limb fractures associated with infected wounds), two laparotomies, three caesarean sections and 18 deliveries. Ten of these patients (six adults and four children) were operated on within the first 48 h and underwent further surgery several times over the following days. A total of eight children (age range 5 to 9 years old) underwent anaesthesia.

Owing to language comprehension issues and the disaster context, in the majority of cases the Swiss anaesthetists could only perform a superficial preoperative anaesthesia assessment. Although this assessment was more accurate when performed by the Nepali anaesthetist, the superficial assessment indicated that most of the patients were classified ASA I or II. Despite the disaster context, all patients received (most of the time from a Nepali doctor or nurse) information concerning the operation and anaesthesia, and signed an informed consent document.²

Nineteen general anaesthetics, 11 ultrasound axillary blocks, nine intrathecal anaesthetics, eight scalp blocks and one local infiltration were successfully performed. Owing to the shortage of halothane, only a limited number of children could be induced by face mask. Thereafter, intravenous ketamine was used for general anaesthesia. Postoperative pain was treated with the available medication (paracetamol, diclofenac, tramadol). No major complications arising from anaesthesia were observed. During the immediate postoperative period, assessments of vital signs, including pulse oximetry, were performed by Nepali nurses in the shared surgical and obstetric ward.

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Specific characteristics of anaesthesia after the Nepal earthquake

Every earthquake generates specific and particular issues at all levels of the health system, of which anaesthesia is only a small part. However, every situation brings new insight into specific topics and allows corrective measures to be planned for the future. Two specific issues from the Nepal experience merit description and analysis.

Blood transfusion

Routine postoperative blood analysis showed a haemoglobin level lower than 6 g dl^{-1} in nine of the first 10 patients operated on, despite relatively low perioperative blood loss. These patients subsequently received blood transfusions. The high prevalence of anaemia in Nepal,³ in addition to the fractures and infections presented by the patients, are the most likely causes of low preoperative haemoglobin levels. The prevalence of anaemia in Nepal can be as high as 65% in women, adolescents and children and is mainly because of nutritional iron deficiency, parasitic infections and thalassaemia.^{4,5}

Blood transfusion was organised by the local team, which requested blood donations initially from each patient's relatives then from the relatives of other patients. The blood transfusion was organised according to the Nepalese blood transfusion protocol. Transfusions consisted only of whole blood, as the transfusion centre did not have the required facilities to separate the blood components. The centre would perform all three phases of blood cross-match prior to dispatch. The checklist prior to transfusion included the bag number, blood group and Rhesus status, and the collection date. Under normal circumstances, blood would be refrigerated in the blood bank and dispatched only when requested by a medical doctor.

The issue of blood transfusion is important and potentially life threatening. Indeed, blood transfusion policies and protocols differ from one country to another and blood banks may be rendered nonfunctional as a result of an earthquake. Therefore, blood transfusions may be impossible when required in an emergency. This raises the question of initiating non-life-threatening orthopaedic surgery without any possibility of transfusion, particularly in a population with a high prevalence of anaemia. In our case, the local facilities were sufficient and we did not have to activate our own blood transfusion/cross-match equipment.

Patient and anaesthetist safety during aftershock

During one case, an episode of severe aftershock resulted in the surgical team leaving the operating room. However, because halothane mask anaesthesia was being used at the time, the patient and anaesthetist had to remain. Thanks to the precautionary measure of laying the 70-kg oxygen cylinder horizontally on the ground, major complications were avoided. It soon became apparent that,

during such severe aftershocks, evacuating a patient with regional anaesthesia would be simpler than doing so with a patient under general anaesthesia.

In normal conditions, anaesthetists and patients are exposed to many well known dangers inside the operating room.^{6,7} Building collapse and the falling down of heavy material are additional risks specific to an earthquake setting. Several preventive and corrective measures should be taken into account to improve the safety for both the anaesthetist and the patient in the case of severe aftershock. The best approach to minimise the risk of injuries from building collapse during aftershock would be to work in a field hospital, as many teams did after the Haiti earthquake.⁸ If a team is designated to be deployed into an existing hard structure, safety precautions must be adopted. The noncollapsed building must be specifically assessed by an engineer with skills in seismology. Inside the building, all heavy apparatus, heavy oxygen cylinders, portable surgical lights and medical storage furniture should be securely fastened or tied down. Exits must be identified and unobstructed. A stretcher to transport the patient must be available and ready. Loco-regional anaesthesia may not require supplemental oxygen and allows for a faster and safer evacuation of everyone when necessary and, wherever possible, should be preferred over general anaesthesia. A helmet for all personnel present in the operating room, including the patient, is highly recommended for protection from falling or damaged ceiling material. If rapid egress from the building is not possible when shaking begins, the usual recommendations are 'drop, cover and hold on' (http://www.earthquakecountry.info/downloads/Shake_Out_Recommended_Earthquake_Safety_Actions.pdf).

Conclusion

Our experience of anaesthesia and surgery in the wake of the 2015 Nepal earthquake disaster were quite similar to our typical daily practice in a European hospital. Despite the exceptional circumstances, we were able to provide anaesthesia care in line with international safety standards. Our major concerns were patient and medical team safety during aftershock, and blood transfusion issues.

Based on our experience, we recommend that anaesthetists entering an earthquake region pay particular attention to both the team and patient safety during aftershocks by implementing the above-mentioned recommendations.

Regarding the issue of blood transfusion, we also recommend gaining an understanding of the background health of the country, not only within the context of the disaster but also with regard to the general health situation, such as the prevalence of anaemia. Second, independently of the dramatic and emotional context, before initiating any surgery, the anaesthetist must be aware of the local capability to support blood transfusion.

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