ANAESTHETIC MANAGEMENT OF PATIENT WHO SUSTAINED HIGH VOLTAGE ELECTRIC BURNS POSTED FOR ELECTIVE RECONSTRUCTIVE PROCEDURE

Rashmee Vijay Chavan[1], Sandeep Sambhajirao Kadam[2], Sheetal Kamalakar Desai[3]

[1]Associate Professor, Department of Anaesthesiology, Dr. D.Y. Patil Medical College, Kolhapur, Maharashtra, India.
[2]Associate Professor, Department of Anaesthesiology, Dr. D.Y. Patil Medical College, Kolhapur, Maharashtra, India.
[3]Assistant Professor, Department of Anaesthesiology, Dr. D.Y. Patil Medical College, Kolhapur, Maharashtra, India.

HOW TO CITE THIS ARTICLE: Chavan RV, Kadam SS, Desai SK. Anaesthetic management of patient who sustained high voltage electric burns posted for elective reconstructive procedure. J. Evid. Based Med. Healthc. 2017; 4(85), 5018-5021. DOI: 10.18410/jebmh/2017/1000

PRESENTATION OF CASE

A 50 years old man, electrician by occupation, was brought by relatives after being found unconscious at working place with burns over head and thigh. There was witnessed history of patient sustaining electric shock and fall from electric pole of 4 metres height while working. On arrival patient had regained consciousness, but he was not able to recollect the event. He was disoriented and could not speak properly. On examination, vitals were within normal range. Local examination revealed 5% full thickness (bone deep) charred burns injury to scalp and 7% superficial burns injury to left front of thigh. Patient then received supportive treatment in the form of local dressing, intravenous fluids and antibiotics with monitoring of vitals. There was no cardiovascular or respiratory involvement. His past history was insignificant except for surgery for squamous cell carcinoma of left cheek 10 years back. Further patient was investigated in detail. From second day onwards, patient started developing progressive weakness in all four limbs with power 1 grade in both lower limbs and grade 2 in both upper limbs. Bowel and bladder reflexes were preserved. Deep tendon reflexes were exaggerated. Sensations were preserved. His MRI of brain and cervical spine revealed senile degenerative changes without any fracture dislocation of cervical spine. Findings were not correlating with his presentation. His other routine investigations were within normal range. On 8th day, patient was posted for derotation flap of scalp with skin grafting. From pre-anaesthetic examination, there was one finger mouth opening with limited neck extension making it difficult case for intubation.

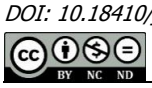
DIFFERENTIAL DIAGNOSIS

Not applicable.

CLINICAL DIAGNOSIS

High voltage electric burn with progressive spinal cord involvement without laboratory or radiological evidence.

Financial or Other, Competing Interest: None.
Submission 02-10-2017, Peer Review 09-10-2017,
Acceptance 20-10-2017, Published 23-10-2017.
Corresponding Author:
Dr. Rashmee Vijay Chavan,
No. 602, Vastushree Vrindavan,
Shivaji Park, Kolhapur-416003,
Maharashtra, India.
E-mail: rashmeevchavan@rediffmail.com
DOI: 10.18410/jebmh/2017/1000



PATHOLOGICAL DISCUSSION

Electric injuries are common and account for approximately 2.5% of all accidental deaths.[1] Electric shock can affect any tissue of the body depending on current strength. It may be low voltage (< 1000 V) electric injury as seen in household electric accidents or high voltage (> 1000 V) electric injury, mainly seen as occupational accidents. It can cause transient or permanent damage to the central and peripheral nervous systems. The effect may be acute or delayed for months or years.[2,3,4] The cerebral involvement may be seen as hemiplegia or coma, while spinal cord involvement can manifest as quadriplegia and transverse myelitis.[5,6] Several possible mechanisms of neurological tissue damage after electric injury have been proposed including direct mechanical trauma, thermal damage, vascular damage and electrophysiological changes.[7] These neurological complications secondary to electric injury can manifest themselves either early or late.[8] Ours was a case of high voltage electric injury with central nervous system complication in the form of progressive lower motor neuron disease affecting all four limbs without MRI evidence of spinal cord necrosis. Concerns about anaesthesia for such cases are multi-systemic organ involvement due to damage by electric current, delayed onset and progressive neurological complications which are occult at the time of presentation. To summarise there were following problems regarding anaesthesia in our case:- 1. Approximate proposed duration of surgery was 2 hrs. with neck in flexion position, so it was not possible to think of doing a case under local anaesthetic infiltration alone as the patient was not so cooperative; 2. Previous history of head and neck cancer surgery making it a case of difficult intubation; 3. Also small oral aperture made it an impossible case to use SGD like LMA or IGEL. Previous surgery and edentulousness of patient making it difficult for mask ventilation too; 4. Patient was not cooperative to allow us to use fibreoptic awake intubation, also we were not much trained in that area; 5. Suxamethonium which is a gold standard drug for providing ideal intubating condition is contraindicated in patients with recent burns. Considering these problems, we planned to do surgery under regional and general anaesthesia without use of muscle relaxants.

DISCUSSION OF MANAGEMENT

Patient was taken inside the operation theatre after adequate fasting period of 6 hrs. and confirming written informed consent. All lab reports were reviewed and

confirmed. Wide bore IV line was secured on the dorsum of the left hand and basic multiparamonitor with NIBP, Spo2, 5-lead ECG and EtCO2 was applied. Check awake laryngoscopy was done with TAS videolaryngoscope for primary assessment of difficulty during intubation and 10% xylocaine was sprayed down the laryngopharynx till vocal cords. Then the patient was given sedation in the form of Inj. midazolam 1.5 mg IV and Inj. glycopyrrolate 0.2 mg IV. Then we proceeded for scalp block.[9] It was under sedation (Figure 1 and 2) as follows:- 1. Bilateral supraorbital block at supraorbital foramina; 2. Bilateral zygomaticotemporal block at outer corner of eyebrow just above the zygomatic arch; 3. Bilateral auriculotemporal block at 0.5 cm distance in front and above the tragus; 4. Bilateral greater occipital block at 1/3 distance from occiput on occipitomastoid line, medial-to-occipital artery pulsations; 5. Bilateral lesser occipital at 2/3 distance from occiput on occipitomastoid line, lateral-to-occipital artery pulsations. At each site, 2.5 cc of 0.25% bupivacaine injected keeping in mind not to exceed toxic dose. Then fascia iliaca block was given to right thigh for harvesting a skin graft. This block was given with double pop: loss of resistance technique at junction of lateral 1/3 to medial 2/3 of line joining anterior superior iliac spine to pubic symphysis at 1 cm below this point with 15 cc of 1.5% lignocaine with adrenaline. After completion of block procedure, patient was given fentanyl 2 mic/kg IV and 100% oxygen by mask. As there was limited mouth opening (Figure 3), we decided to proceed with TAS SCOPE without relaxant. Then patient was induced with propofol 3 mg/kg IV after checking adequacy of level of unconsciousness by loss of corneal reflex. Patient was intubated with proper sized, well lubricated endotracheal tube with the help of TAS videolaryngoscope over a bougie (Figure 4). Patient tolerated the procedure very well. Then patient was maintained on O2: N2O 50:50 with isoflurane 1%. Patient was given propofol drip as 3 mg/kg/hr as maintenance and Inj. dexmedetomidine 50 mic in drip for first 10 mins as an adjuvant. Patient was kept on spontaneous ventilation throughout the procedure (Figure 5 and 6), which lasted for 1.5 hrs. Patient tolerated surgery very well. At the end of the surgery, isoflurane stopped and propofol drip discontinued. Patient was allowed to breathe 100% oxygen. After 10 mins patient was fully awake and obeying commands, so was extubated and was shifted to recovery. He was totally pain-free and comfortable.

Though there are no specific guidelines about perioperative management of patient with electric burn injuries, careful screening to avert possible underlying damage to various tissues/organs and judicious use of anaesthetic technique and drugs with extensive monitoring are the principles involved. High voltage electric injury patients either die immediately due to cardiac event and extensive burns or survives with immediate, delayed or late neurological complications. Such patients are at risk of anaesthetic complications due to multiorgan system involvement, such as patients are at risk of acute hyperkalaemia and death if given gold standard drug suxamethonium for intubation.[10] Cerebral and spinal cord involvement make them susceptible to autonomic dysreflexia[10] under anaesthesia. Central neuraxial blocks may prove to be dangerous in such volume depleted patients. They are more susceptible to neural toxicity of local anaesthetics, because of ongoing progressive neurological damage. They are very prone for acute renal failure and rhabdomyolysis. Monitored anaesthesia care may be difficult in them due to muscle spasm and disturbed psychology due to cerebral involvement.[10] Inducing agents like ketamine may exaggerate muscle spasm. If there is occult progressive neurological damage, then use of non-depolarising relaxant would be hazardous and should be used cautiously in view of future involvement of litigation. Here, in our case as there was anticipated difficult intubation we had opted for videolaryngoscopy[11,12] and intubation without relaxants.[13] As we all know, large proportion of MAC requirement goes towards suppressing the response of endotracheal intubation and later the tube tolerance and good intubating conditions can be obtained with the use of alfentanil, remifentanil with propofol.[13] Muscle relaxant for the sole purpose of tolerating the tube is unnecessary when sufficient MAC is achieved to produce unconsciousness. We have many situations where muscle relaxation is unnecessary, except may be to facilitate endotracheal intubation. Most non-abdominal and non-thoracic surgeries fall in this group. Thus, the well-known drawbacks of use of muscle relaxants such as prolonged apnoea, postoperative pulmonary complications and residual paralysis are avoided. In our case we supplemented general anaesthesia with regional block technique, scalp block for head area[9] and fascia iliaca block for skin harvesting, which provided prolonged postoperative analgesia as well which is much desirable in such painful procedures. As there were limitations for use of awake fibreoptic intubation and supraglottic airway devices in our case with limited jaw opening.[14] We used a TAS scope, a new version of videolaryngoscope which is very convenient to use and less bulky. Thus with GARA (general anaesthesia with regional anaesthesia) technique, the entire perioperative period was uneventful.

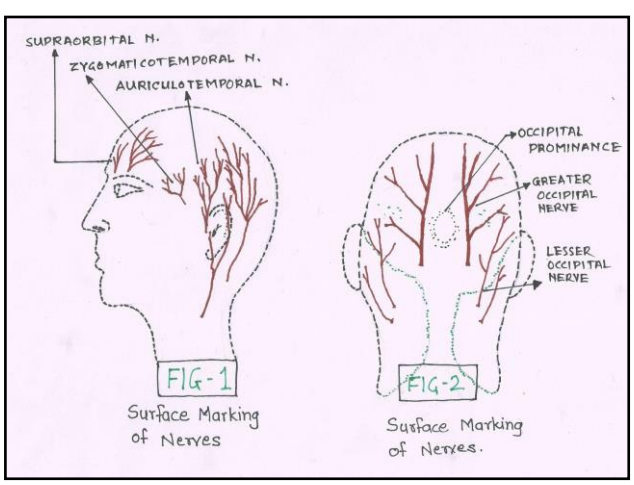


Figure 1 and 2. Surface Marking of Nerves

Figure 3. Limited Mouth Opening

Figure 4. Preoperative Scalp Burns

Figure 5. Postoperative Scalp Wound

Figure 6. TAS Videolaryngoscope

FINAL DIAGNOSIS

In conclusion, high voltage electric burns with neurological complications can be managed safely and successfully with opioid based general anaesthesia without using muscle relaxants with supplementation of local peripheral blocks.

REFERENCES

[1] www.ncrb.gov.in. Accidental deaths and suicides in India. Report by National Crime Records Bureau. Ministry of Home Affairs, 2010. http://ncrb.nic.in/ADSI2010- full-report.pdf.
[2] Farrell DF, Starr A. Delayed neurological sequelae of electrical injuries. Neurology 1968;18(6):601-606.
[3] Leibovici D, Shemer J, Shapira SC. Electrical injuries: current concepts. Injury 1995;26(9):623-627.
[4] Gallagher JP, Talbert OR. Motor neuron syndrome after electric shock. Acta Neural Scand 1991;83(2):79-82.
[5] Jackson FE, Martin R, Davis R. Delayed quadriplegia following electrical burns. Proc of the Annual Clinical Spinal Cord Injury Conference 1964;13:40-45.
[6] So SC, Lee ML. Spastic quadriplegia due to electric shock. BMJ 1973;2(5866):590.
[7] Smith MA, Muehlberger T, Dellon AL. Peripheral nerve compression associated with low-voltage electrical injury without associated significant cutaneous burn. Plast Reconstruct Surg 2002;109(1):137-144.
[8] Ratnayake B, Emmanuel ER, Walker CC. Neurological sequelae following a high voltage electrical burn. Burns 1996;22(7):574-577.
[9] Amiri HR, Kouhnavard M, Safari S. Scalp block for awake craniotomy in a patient with frontal bone mass: a case report. Anaesthesiology and Pain Medicine 2012;1(3):187-190.
[10] Kanonidou Z. Anaesthesia for chronic spinal cord lesions. Review Article Hippocratia 2006;10(1):28-31.

[11] Sun Y, Liu JX, Jiang H, et al. Cardiovascular responses and airway complications following awake nasal intubation with blind intubation and awake fibreoptic bronchoscope: a randomized controlled study. European Journal of Anaesthesiology 2010;27(5):461-467.

[12] Fitzgerald E, Hodzovic I, Smith AF. 'From darkness into light': time to make awake intubation with videolaryngoscopy the primary technique for anticipated difficult airway? Anaesthesia 2015;70(4):387-392.

[13] Erhan E, Ugur G, Alper I, et al. Tracheal intubation without muscle relaxants: remifentanyl or alfentanyl in combination with propofol. European Journal Anesthesiology 2003;20(1);37-43.

[14] Giraud O, Bourgain JL, Marandas P, et al. Limits of laryngeal mask airway in patients after cervical or oral radiotherapy. Cann Journal Anaesth 1997;44(12):1237-1241.