VENTILATORY MANAGEMENT OF PATIENTS WITH NEUROPARALYTIC ENVENOMATION

Dr. Harsoor S. S. 1  Dr. Gurudatta C. L. 2  Dr. Balabhaskar S. 3  Dr. Kiranchand N. 4  Dr. Raghavendra Bhosale 5

SUMMARY

The subjects for the study are victims of Elapidae snake bite (Common Krait) envenomation with neuroparalytic respiratory failure admitted to RICU. The incidence of snake bite is very high in the period of February to September, each year. 87% of the bite incidents occurred during night and often the snakes could not be identified. The mean time for presentation at the hospital was 7 hours after the bite.

The important manifestations were Ptosis (100%), altered sensorium / drowsiness and 1/5 to 3/5 motor power (93% patients). A mean total dose of 146 ml of polyvalent ASV was administered over a period of about 48 hours. Except 2 patients, rest all were ventilated with SIMV for mean 51 hours 38 min & later CPAP mode for 35 hrs 43 min, before weaning from ventilator. Four patients died, one due to hypoxic brain damage prior to start of mechanical ventilation and other three succumbed to ventilator associated complications. The other minor complication of LRTI (5 patients), local cellulitis (3 patients) and visual disturbances in 3 patients were managed successfully.

Keywords: Snake bite envenomation, ASV, Respiratory failure, Mechanical ventilation.

Introduction

The morbidity and mortality following snake bites is a frequently encountered problem in India. Elapid snake bites are among the most lethal, resulting in muscle paralysis due to curare like neuromuscular blocking action affecting the muscles of Eyes, Throat and Chest.1,2,3 The Bungarotoxin present in neuroparalytic snake venom, acts on presynaptic and synaptic sites.3,4 The polyvalent anti snake venom, which is effective in reversing synaptic blockade, cannot reverse the presynaptic block. If respiratory failure occurs, these patients require ventilator assistance for a variable period of time,5,6 along with supportive measures. We present our experience in management of snake bite victims at the Respiratory Intensive Care Unit (RICU), suffering from neuropaaralytic respiratory failure.

Material and methods

Only patients who developed Neuroparalytic respiratory failure following snakebite envenomation admitted to our hospital are included in this study. The observations included time for onset of respiratory paralysis, type of snake, site of bite, other systemic manifestations such as ptosis, cyanosis etc.

All the patients were intubated with appropriate size Endotracheal tube and ventilated using Drager Savina and Horus Taema Ventilators. They were put on IPPV or SIMV modes with pressure support, depending on degree of respiratory paralysis. Following recovery of adequate respiratory efforts, weaning was initiated with CPAP ventilation. A T-piece trial was attempted before the patients were extubated. Along with ventilator support, all patients were given neostigmine 1 mg / 2 hr IV along with atropine and polyvalent ASV in a loading dose of 50 ml, followed by 1 vial (10 ml), 8th hourly as continuous infusion, till good motor recovery.

All patients received humidified air, with FiO₂ 0.5 with maintenance of asepsis, chest physiotherapy, and care of ETT. All patients were continuously monitored with ECG, HR, SPO₂, NIBP, temperature, CVP, fluid Input / Output with ABG obtained when necessary.

The routine haematology, ECG on admission, Prothrombin time and Platelet Count and renal function tests conducted, wound care at bite site and tetanus prophylaxis and appropriate antibiotics instituted. The patients were observed for evidence of side effects of ASV, ventilator associated complications such as pneumonia, septicemia or barotrauma.

The total dose of ASV received, the duration of ventilation with IPPV or SIMV with PSV, duration of CPAP required and T-piece ventilation and the overall outcome
were studied. The duration of total stay in RICU and any evidence of residual neurological complications were studied.

Results

Fifty seven (57) patients were admitted to RICU, following snake bite envenomation and subsequent Neuroparalytic respiratory failure. There were 39 male & 18 female patients and the age group ranged from 9 – 65 years with 51(89%) patients being in 11 – 40 years age group. The positive history of snake bite could be elicited in only 38 (67%) patients. Majority of snake bites (in 48 patients) occurred during February to September period and 46 (81%) snake bites took place during 10 PM – 4 AM., indicating midnight preponderance.

As many as 51 (89%) patients did not have knowledge of type of snake. In 35 (61%) patients, bite marks were undetectable despite positive history. The site of bite was evenly distributed between proximal and distal parts of body.

About 38 patients needed 2 – 10 Hours to reach the hospital & mean duration of time required was 7 hours. All patients had stable CVS with mean pulse rate of 96 BPM & the mean systolic & diastolic BP being 120 and 76 mm Hg respectively & MAP of 91 mmHg.

The mean time needed for respiratory paralysis to manifest was 13 hours 45 min. All the 57(100%) patients manifested with ptosis, and 4 patients complained of dysphagia. The chief complaint ranged from altered sensorium to complete unconsciousness in 46 patients. The motor power was 1/5 to 3/5 in 53 (93%) patients.

Specific treatment with polyvalent ASV bolus dose 50 ml was needed in 33 patients and remaining 24 patients were administered upto 100 ml of ASV. The mean ASV needed on 1st day was 49 ml, 2nd day 33 ml. On 3rd day it was 6.14 ml (only 13 patients needed ASV), indicating that ASV is needed mostly for the first 48 hours. And none of the patients developed any untoward reactions to ASV infusion.

Only two out of 57 patients needed IPPV initially. All were ventilated with SIMV mode for a mean duration of 51 hours 38 min. Following improvements in respiratory efforts, patients were changed to CPAP mode and ventilated for a mean duration of 35 hr. 43 min.

Five patients had LRTI, and three patients developed cellulitis at bite site and three patients developed visual disturbances, all the events being managed successfully. All patients were observed for a further period of six hours and shifted to respective medical wards, before being discharged from hospital.

Discussion

Snakebite victims are the second most common patients being placed on mechanical ventilation in the respiratory critical care unit of our institution. Hence a study was undertaken to describe the epidemiology, clinical features, and study acute complications & intensive care management of these patients.

All our patients are from poor socioeconomic status from villages who work in the fields, stay in the huts & sleep on the open floor and hence more are prone for snake bites. 90% of them are above 10 years of age with male (68%) preponderance, as was observed by Seneviratne. U et al, N. Sharma et al and Kulkarni et al. About 84% of the bites occurred during the period between February to September i.e. during summer and rainy season and also in the nights between 10 PM to 4 AM. Similar climate and time preponderance were observed in studies by Fernando et al, which shows the influence of environmental temperatures & rain with midnight preponderance.

Bite marks or fang marks were not seen in 61% of patients despite positive history and there are no inflammatory signs and 50% of the bites were to the distal parts of the body as was observed by Kularatne (46%), Sharma et al (71%) and Kulkarni et al (80%).

Mean time taken for the patients’ arrival in hospital after the bite was 7 hrs in our study, which compares closely with those observed by SAM Kularatne (7hrs) and Sharma et al (9 hrs).

No patient had hypotension in our series. 40% patients had heart rate above 100/min, as seen with 56% of victims in the study by Kularatne.

All the patients developed ptosis, which was the common finding observed by Senevirathne et al (85%), Sharma et al (75%), and Kularatne (82%). Motor power in our study on admission was 3/5 to 1/5 in 93% of patients, unlike 64% in the study by Kularatne. 73% of patients were drowsy to unconscious on arrival in the hospital, similar to observation by Kularatne (71%).

56 patients were given anti snake venom. The mean loading dose was 58 ml & the total dose requirement was 146 ml, which is 100 ml & 500 ml respectively in the study by Agarwal et al & the mean total dose was 500 ml with Sharma et al. The total dose & the bolus dose requirement in our study is less than the recommended dose (Warrell DA et al) & also compared to other studies (Tariang et al). This probably may be due to all patients being given neostigmine (Bomb B.S. et al). None of our patients developed any adverse reactions to ASV.
In our study the mean duration of ventilation was 82 hrs with a range from 14 hrs to 360 hrs; which is 48 hrs with Kularatne\textsuperscript{11} with a range of 12 hrs to 29 days, which compares well with our study.

Four patients out of 57 died. One patient died after 305 hrs of mechanical ventilation due to hypoxic brain damage developed before initiation of mechanical ventilation and three others due to ventilator associated complications. Neuroparalysis occurs in Elapidae snake bites & in our study 9 snakes were brought & identified as common krait. There were no bite marks or local cellulites in 62% of patients and 80% patients were bitten unprovoked & inside the huts while sleeping. Since Neuroparalysis developed late (13 hrs 47min after the bite), we feel that the most common snake in our area is Bungarus caeruleus, the Indian common krait.

References
4. Harrison’s Principles of Internal Medicine. 15\textsuperscript{th} Ed. 2617-2618.
METHODS: Forty-one patients on volume controlled continuous mandatory ventilation were randomized to weaning with PSV alone (PSV group, 18 patients) or PSV plus ATC (ATC group, 23 patients). In both groups, PSV was initially set at 15 cm H(2)O, and CPAP at 5 cm H(2)O, with progressive downward titration. The ATC group additionally, received inspiratory ATC at 100% through a ventilator-software-driven algorithm. The primary outcome measure was weaning duration.