



Surgery

A STUDY OF ELECTRICAL BURN INJURY IN BUNDELKHAND REAGION

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*Corresponding Author**ABSTRACT****Introduction-** Electrical damage caused by electric current passing through body. Electric burn injury may be domestic or commercial. Electric current are of two types- AC and DC.**Material and method** – This observational study of electric burn cases from O.P.D. and emergency of Medical College, Jhansi between 2014 to 2016 total 98 cases included.**Result-** Male-77(78.57%),Female-21(21.42).Male common age group 21-30 years 24(24.48%) and females is 0-10 years 8(8.16%). Hindu 86(87.75%),Muslim 12(12.24%),Educated 39(39.79%) , illiterate 59(60.20%), most common in farmers 30(30.61%), Rural population 67 (68.36%),urban 31(31.63%) ,married 55 (56.12%),unmarried43(43.87%),Joint family 58(59.18%),nuclear 40(40.81%),Low class 83(84.69%),Middle class-15(15.30%), male high voltage burn 06(6.12%),low voltage 71(72.44%). female high voltage electric burn 01(1.02%) and low voltage 20(20.40%).Industrial 07 (07.14%), Household 91(92.85%), Superficial 93(80.61%) and deep burn 05(5.10%).**Conclusion-** This study analyse the effect and outcome of electrical burn.**KEYWORDS :** electrical injury,AC and DC,TBSA**Introduction-**

Electrical damage caused by electric current passing through body. Electric burn injury may be domestic or commercial. These are the second most important cause for admission to burn unit. Electric current are of two types- AC and DC. House hold electricity is more dangerous than DC. DC current is provided by batteries. Low frequency AC at 50-60Hz cause extended muscle contraction which freeze hand to current source.

Severity of electric burn injury depends on following factors-

1. Type of current (DC or AC)
2. Voltage and ampere range
3. Duration of exposure
4. Body resistance
5. Pathway of current in body which determine tissue damage.

Tissue damage due to electrical exposure is primarily by conversion of electric energy to heat resulting in thermal injury. The body tissue with highest resistance tend to suffer more damage. Maximum resistance is provided by skin and all internal tissue has negligible resistance. Current pathway through the body also determine which structure will be injured. Hand is most common source point followed by head while foot is most common ground point.

Pathology—

Passing of high electric field cause thermal or electric chemical damage to internal tissue. Damage include hemolysis, protein coagulation, coagulation necrosis of muscle and other tissue, thrombosis, dehydration and muscle and tendon avulsion. High electric field strength injuries result in massive edema leading to compartment syndrome. Muscle destruction can result in rhabdomyolysis and myoglobinuria and electrolyte disturbances.

Aims and objectives

1. Epidemiological study of electric burn in Bundelkhand.
2. To analyze the effect of various factors on the extent and severity of electric injury.
3. To analyse the outcome of electric burn injuries in our unit.

Material and method

This study based on patient admission in O.P.D. and emergency of Medical College, Jhansi between a period two year from 2014 to 2016 with complaints of electric burn injuries are considered in this study.

Inclusion criteria

- All patient with electric burn

Exclusion criteria

- Patient with other associated severe injuries (like head injury and

other serious injury)

- Patient who were dead on arrival.

Result-

Total patient 98, Male-77(78.57%), Female-21(21.42)

TABLE 1:

Age and gender wise distribution (N=98)- Most common age group in male between 21-30 years 24(24.48%) . In females most common age group is 0-10 years 8(8.16%)

| Age group (yrs) | Male | Percentage | Female | Percentage |
|-----------------|------|------------|--------|------------|
| 0-10 | 07 | 07.14% | 08 | 08.16% |
| 11-20 | 19 | 19.38% | 02 | 02.04% |
| 21-30 | 24 | 24.48% | 02 | 02.04% |
| 31-40 | 16 | 16.32% | 06 | 06.12% |
| 41-50 | 07 | 07.14% | 02 | 02.04% |
| 51-60 | 04 | 10.52% | 01 | 01.02% |

Hindu 86(87.75%) and Muslim 12(12.24%)

Educated 39(39.79%) and illiterate 59(60.20%)

TABLE 2: Occupation wise distribution

In this study electrical injury is most common in farmers 30(30.61%)

| Occupation | Number of patients | Percentage |
|-------------|--------------------|------------|
| Child | 06 | 06.12% |
| Electrician | 08 | 08.16% |
| Farmer | 30 | 30.61% |
| House wife | 11 | 11.22% |
| Labour | 13 | 13.26% |
| Shop Keeper | 05 | 05.10% |
| Student | 25 | 25.51% |

Rural population 67 (68.36%) and urban 31 (31.63%)

Married 55 (56.12%) and unmarried 43(43.87%)

Joint family 58(59.18%) and nuclear family 40(40.81%)

Low class 83(84.69%), Middle class-15(15.30%)

In male high voltage electric burn present in 06(6.12%), low voltage 71(72.44%). In female high voltage electric burn present in 01(1.02%) and low voltage 20(20.40%)

Industrial 07 (07.14%), Household 91(92.85%)

Superficial burn 93(80.61%) and deep burn 05(5.10%)

Distribution of patients according to percentage of total body surface area(TBSA) involving - 2-25% in 86(87.75%), 26-50%-12(12.24%) and 51% and above 00

Distribution of cases according to area involving in burn -

Face 08(08.16%),Chest-40(40.81%),Abdomen-13(13.26%),Back 01(1.02%),Upper limb-70(71.42%),Lower limb-38(38.77%)

Distribution of patients according to contract point -

Back-02(02.04%),Chest 09(9.18%),Left foot-01(1.02%),Right foot-0, left hand 28(28.57%),Right hand-44(44.89%),Left thigh-04(4.08%),Right thigh-00,Left arm-00 ,Right arm-01(1.02), Left elbow-00, Right elbow-01(1.02) and Head-08(8.16%)

Table 3: distribution of patients according to outcome

| Outcome | Number of patients | Percentage |
|--|--------------------|------------|
| Survivor with no deformity | 20 | 25.97% |
| Survivor with deformity without amputation | 44 | 44.89% |
| Survivor with amputation | 09 | 11.68% |
| Death | 04 | 05.19% |

Table 4: effect of electric current on heart, electrolyte balance & kidney

| Burn Percent | Cardiac Effect (ECG Change) | Electrolyte balance | Kidney |
|--------------|-----------------------------|---------------------|--------|
| 0-10% | - | No | No |
| 11-20% | - | No | No |
| 21-30% | 2 | - | - |
| 31-40% | 2 | - | 1 |
| 41-50% | 2 | 2 | 1 |
| 50%-on wards | - | - | 2 |

Discussion

Electricity is definitely a boon to the mankind but this turns into a curse when it becomes a cause of disaster. Electrical burn injuries are the most destructive injuries with a potential of causing significant functional disability and extensive disfigurement in the survivors.

Electric burn injury is one of the most destructive injuries seen in a casualty room of any hospital. It is a special type of injury with potential of causing significant functional disability and extensive disfigurement. Electric burns can be caused by high tension and low tension currents. The intensity of the electric burn depends upon the voltage, current flow and resistance offered by the tissue. The damage caused by the electric burn is due to two mechanisms, local generation of heat and direct action of passage of current through the tissues. The heating causes coagulative necrosis of the cells and current causes disruption of cell membrane leading to cell death and tissue loss.

In this study majority of cases were in age group between 21 to 30 years. Our observations are consistent with studies conducted by **Mellen PF et al (1992) & Reyaz Ahmad Kasana et al (2013)** in which peak incidence of age group between 21 to 30 years.

In this study total male patients are 77 (78.57%) while female patients are only 21 (21.42%). Our study matches with the study of **Smith S. Segu et al (2014), Ulus Trabmi Acil Cerehi derg (2016) and Reyaz Ahmad Kasana et al (2013)**.

In this study rural population 67(68.36%) was most commonly involved then urban 31 (31.63%). So our study is in concordance with **Sameer Jain et al (2014) and Ryaz Ahmad Kasana et al (2013)**

In this study electric burns is more common in illiterate person 59 out of 98(60.20%) than educated persons 39 (39.79%). Our study observations are consistent with study of **Buja Z et al (2010)**

In our study rural population specially farmers 30 out of 98 (30.61%) are mostly involved in electric current injury which is more of work related injury. Our study is consistent with **Umar Farooq et al (2010), Gang RK et al (1992) and Smith S Segu et al (2014)**.

In our study mostly people of low socioeconomic group 83 out of 98(84.69%) involved in electric burn injury. Our study is in concordance with **Sameer Jain et al (2014), Reyaz Ahmad Kasana et al (2013)**

In our study most of the electric burn patients have 2 to 25 percent of total burn surface area (TBSA) 86 out of 98 (87.75%). Our study is consistent with the studies of **Ajay Lunawat et al (2013), Gang RK et al (1992), Smith S Segu et al (2014) and Hadded SY (2008)**.

In our study most patients involved had house hold burn 91 (92.85%) and industrial burn 7 (7.14%). Our study is consistent with study of **Martinez JA et al (2006)**.

In our study, both limbs are involved commonly in electric burn injury. Upper limb is the most involved part 70 (71.42%) followed by lower limb 38 (38.77%) followed by chest 40 (40.81%). Our study is consistent with study of **Hadded SY et al (2008)** who concluded that upper limb and hand 70 (71.42%) and lower limb 38 (38.77%) are most commonly involved parts in electric burns.

In our study right hand is most common contact point 44 (44.89%) followed by right lower limb. Our study correlates with the study of **Ryaz Ahmad Kasan et al (2013)**.

In our study 10 patients have high voltage electric burns which is 10.20% of total, rest 88 patients out of 98 have low voltage electric burn which is 89.79% of total. Our study is consistent with study of **Shih JG et al (2017)** in which 44% patients had low voltage injury and 38.3% had high voltage injury.

In our study Hindu population 86 (87.75%) was more involved than Muslim population which is 12 (12.25%).

In our Study Married population is more involved in electric burn injury 55 (56.12%) than unmarried population 43 (43.87%).

In our study joint family members are more involved in electric burn injury than nuclear family member 40 (40.81%).

In our study we also concluded that the effect of current on internal organs including cardiac, renal and the electrolyte changes are more with the increased burn surface area and the increased depth of wound denoting that probability of involvement of internal organs can be depicted by the severity of external surface involved.

Conclusion

1. Most patients involved had house hold burns and industrial burn
2. Aggravation of the use of the electric system appliances leads to increase in number of patients with electric injury.
3. Rural population was most commonly involved than urban.
4. Hindu population is more involved than Muslim population.
5. Married population is more involved in electric burn injury than unmarried population.
6. Joint family members are more involved in electric burn injury than nuclear family member.
7. Males patients were most commonly involved than females showing that in Indian population the males who go out of the house to work are more prone to electric burn injuries.
8. It was observed that majority of cases were in age group between 21 to 30 years.
9. Electric burns are more common in illiterate person than educated persons.
10. Mostly people of low socioeconomic group are involved in the electric burn injury.
11. Right hand is most common contact point followed by right lower limb.
12. The probability of involvement of internal organs can be predicted by the extent of external involvement. The probability of cardiac, renal and electrolyte involvement increases with the extent of burn surface area.

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