

# Gas gangrene in *Sushruta samhita*

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## Abstract

Gas gangrene is a rapid spreading infective type of gangrene of the muscles characterized by collection of gas in the muscles and subcutaneous tissue. Gas gangrene is caused by clostridial infection (*Clostridium perfringens*/*Clostridium welchii*) due to the fact that it is also called as “clostridial myonecrosis.” *Sushruta samhita* is one of the three *Brihat trayee* (major classical *Ayurvedic* texts) and it belongs to the surgical school founded by *Dhanvantari*. The present article deals with the reference of gas gangrene-like condition in *Sushruta samhita*. There is a reference regarding muscular wounds which are characterized by gas and crepitations and considered as fatal in *Sushruta samhita*, *Sutra sthana*, 28<sup>th</sup> chapter named “*vipareetaavipareeta vana vigyaneeyam*.” The wounds which make harsh, groaning, and sparkling sounds; those located in skin and muscle emit air with sound are fatal. Gas and crepitations were considered as fatal signs in muscular wounds according to *Sushruta*. The earliest record of gas gangrene and its fatal outcome is found in *Sushruta samhita*.

**Key words:** *Ayurveda*, *Clostridium perfringens*, *Clostridium welchii*, gas gangrene, *Sushruta samhita*, wound

## INTRODUCTION

*Sushruta samhita* is one of the three “*Brihat trayee*” (major classical *Ayurvedic* texts) and it belongs to the chief treatise of its surgical school, i.e. “*Dhanvantara sampradaya*” founded by “*Dhanvantari*.” The presently available version of *Sushruta samhita* has evolved through multiple transformations and redactions by many scholars time to time over several 100 years. The original *Sushruta samhita* is claimed to be a work of 10-7<sup>th</sup> century BC. However, according to historians, the presently available redacted *Sushruta samhita* is not older than 1<sup>st</sup> century AD.<sup>[1]</sup>

The *Sushruta samhita* describes in detail the surgical care of patients. Surgically treatable diseases were identified and indications/contraindications of surgery were described. Designing of a wide range of surgical instruments and their appropriate use is the highlight of *Sushruta samhita*. *Sushruta samhita* explains different types of wounds and their management in an elaborated way. Surgical incisions, their alignment, suturing, and dressing are well described.<sup>[1]</sup>

The present article deals with the reference in *Sushruta samhita* which is similar to gas gangrene.

## Gas Gangrene

Gas gangrene is a rapid spreading infective type of gangrene of the muscles characterized by collection of gas in the muscles and subcutaneous tissue. Gas gangrene is caused by clostridial infection (*Clostridium perfringens*/*Clostridium welchii*) due to the fact that it is also called as “clostridial myonecrosis.” Gas gangrene develops in wounds where there is extensive laceration or devitalization of muscle tissue with gross contamination of the wound either by soil or any other foreign bodies. In such type of wounds, the above organisms (usually multiply in anaerobic conditions) are able to multiply and produce toxins.<sup>[2]</sup>

## Reference of Gas Gangrene in *Sushruta Samhita*

There is a reference regarding muscular wounds which are characterized by gas and crepitations and considered as fatal in *Sushruta samhita*, *sutra sthana*, 28<sup>th</sup> chapter (*vipareetaavipareeta vana vigyaneeyam*); this condition resembles with “gas gangrene.”

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“*Kshvedanti ghrughuraayante jvalanteeva cha ye vranaah Tvak maamsasthashcha pavanam sa shabdam visrujanti ye.*”<sup>[3]</sup>

Those wounds should also be discarded which make rattling sounds or crepitations, which are characterized by extreme burning sensations as also those which confined to the skin and muscles produce gas with sound.<sup>[4]</sup>

The wounds which make harsh, groaning, and sparkling sounds; those located in skin and muscle emit air with sound and those not arisen on vital spot are extremely painful should not be taken up.<sup>[5]</sup>

### **Kshvedanti**

According to *Dalhana* (commentator of *Sushruta samhita*), “*Kshvedanti*” means “producing a sound like *khat khat*.”<sup>[3]</sup> *Kshvedana* also means “hissing” sound.<sup>[6]</sup> The wounds which make *kshvedana* are considered as fatal. These sounds are nothing but the crepitations due to the presence of gas in the wound. In gas gangrene, the muscles gradually undergo various stages of degeneration and lose their contractility, normal healthy color, and characterized by crepitations due to the presence of gas bubbles. The gas is chiefly hydrogen and odorless in the beginning; but soon, it becomes fetid due to the production of sulfurated hydrogen ( $H_2S$ ), ammonia, and volatile gases by the action of proteolytic group of organisms.<sup>[2]</sup>

### **Ghurghuraayante**

“*Ghurghuraayante*” means the one which is producing whistling sounds.<sup>[7]</sup> According to *Dalhana*, “*Ghurghuraayante*” means panting/gasping-like sounds.<sup>[3]</sup> Such types of sounds are due to the presence of gas in wounds (in gas gangrene). These sounds are often palpable and sometimes audible with a stethoscope.<sup>[2]</sup>

### **Jvalanteeva**

According to *Dalhana*, the word “*jvalanteeva*” denotes the burnt or black color of wound.<sup>[3]</sup> Clostridial infection produces a foul smelling necrosis of the muscle which becomes from dull red to green and ultimately black in appearance. Ultimately, the muscle in gas gangrene becomes black due to the action of sulfurated hydrogen on iron liberated from broken down muscle hemoglobin.<sup>[2]</sup>

### **Tvak Maamsastha**

It means the wounds which are located at the level of skin, subcutaneous tissue, and muscle. In gas gangrene also, skin, subcutaneous tissue, and muscles are involved. The crepitus is always present due to the presence of gas in the muscle and subcutaneous tissue in gas gangrene.<sup>[2]</sup>

### **Pavanam Sa Shabdam Visrujanti**

“*Pavanam sa shabdam visrujanti*” means wounds emitting air with sounds. Emitting air with sound is abnormal in case of wounds located in skin and muscles, whereas it is normal in those located in viscera.<sup>[3]</sup>

### **Management and Prognosis**

According to *Sushruta* wounds which make sounds are fatal; ultimately leads to death, not treatable and physician should not attempt to treat such type of wounds to protect his reputation and also the reputation of scriptures. Patients, whose ulcers do not heal in spite of proper treatment from the very beginning, should be discarded by the wise physician who desires to preserve his reputation.<sup>[8]</sup> Wounds which make sounds are considered as “*Arishta*” (signs of imminent death).

Gas gangrene carries a considerable mortality rate. Treatment consists wound excision/debridement, administration of high-dose penicillin, passive immunization by intramuscular injection of antigas gangrene serum, amputation, and hyperbaric oxygenation.<sup>[2]</sup> *Sushruta* has considered gas producing wounds as fatal; lack of powerful antibiotics, immunization, and novel therapies such as hyperbaric oxygenation therapy during the period of *Sushruta* may be the reason for making this condition fatal.

## **CONCLUSION**

Gas and crepitations were considered as fatal signs in muscular wounds according to *Sushruta*. The earliest record of gas gangrene and its fatal outcome is found in *Sushruta samhita*.

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