

**ROLE OF TOPICAL INSULIN IN FOURNIER'S GANGRENE – A CASE REPORT**

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**ABSTRACT**

Fournier's gangrene or idiopathic gangrene of the scrotum has an eruptive course if not identified and managed at the earliest possible. The mainstay of treatment is Intensive care along with thorough surgical debridement and culture sensitive antibiotics. Multimodality treatment is suggested as it hastens the wound healing, thereby shortening the patient stay in the hospital and thereby decreasing the patient mortality and morbidity. We hereby share our experience in managing a case of Fournier's gangrene using topical insulin as an adjunct for wound bed preparation.

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## INTRODUCTION

Insulin resistance is one of the most typical and common pathological changes in diabetes mellitus. Various elements can lead to poor growth of wound granulation tissue, for example, elevated blood glucose (locally and fundamentally), inadequate wound angiogenesis and fibrous tissue deposition<sup>[1,2]</sup>. It has been proved regarding the effect of insulin in numerous animal and wound models, including cutaneous ulcerations, incision wounds and fracture wounds<sup>[3]</sup>. It was established in a previous animal study that insulin could reduce inflammation and increase collagen deposition, thus inducing accelerated burn wound healing<sup>(4)</sup>. Insulin stimulates the growth and development of keratinocytes, endothelial cells, and fibroblasts and helps proliferation, and tissue healing<sup>[5-7]</sup>.

Fournier's gangrene (FG) is fulminant necrotizing fasciitis of the genitalia that progresses from erythema to necrosis<sup>[8]</sup>. Treatment involves surgical debridement of all infected and necrotic tissues and administration of broad-spectrum antibiotics<sup>[9]</sup>. Following radical excision, a wide variety of approaches are used to manage the wound until healing is complete.

The purpose of our study was to observe the role of topical insulin in

preparation of wound bed in the case of Fournier's gangrene.

## Case report:

A 67-year-old gentleman hailing from Tamilnadu, driver by occupation, a known case of diabetes and hyperthyroidism, presented to us with a history of a necrotic patch over the right hemi-scrotum following surgery for hydrocele, which was done 6 days prior. On admission, the patient's general condition was fair; he had toxic features, febrile. Necrotic patch with swelling over the right hemi-scrotum was noted, which was tender. Fournier's gangrene severity index was 10, which showed a morbidity and mortality index was 75%.



**Fig. 1: Fournier's gangrene at initial presentation**

Clinical diagnosis of Fournier's gangrene was made and emergency debridement of the patch was done, which

exposed sloughed out skin of the hemiscrotum, and slough and pale granulation tissue over the testis. The initial Bate-Jensen score of the wound was assessed to be 38.



**Fig. 2: Topical insulin being sprayed over the wound post surgical debridement**

Following surgical debridement, topical insulin was used. Insulin irrigation was done using 4 units (0.1 ml) of human soluble insulin (Actrapid) in 10 ml of normal saline for each 10 cm<sup>2</sup> of the wound. A total of 5 sittings of insulin irrigation were done, each sitting 5 days apart.



**Fig. 3: Scrotal wound after 20 days (5 applications) of topical insulin**

After insulin application the wound was closed traditionally. Serum glucose levels were monitored after each application of insulin and were found to be normal as he was on insulin sliding scale. No drastic side effects were seen with topical insulin. On day 10 we have observed that there was partial fall of necrotic tissue and granulation tissue was present. At the end of 25<sup>th</sup> day the wound bed was healthy and granulation tissue was optimal and we were able to close the defect primarily.



**Fig. 4: Scrotal wound closed Primarily**

## Discussion

Many benefits have been documented apart from regulating blood glucose since the discovery of insulin by Banting in 1921. Rosenthal demonstrated that topically applied insulin and cut-off the healing time and

improves wound tensile strength in Wistar rats [10].

Zhang et al<sup>[11]</sup> tested local insulin-zinc injections on skin donor sites of rabbits. Subcutaneous injections of 0.25 units of long acting insulin-zinc suspensions were directly administered to the skinned backs of adult rabbits. Insulin was injected on alternative days and was correlated to controls who were injected with only placebo and zinc suspension. With localised injection, wound healing was attained in 9 days, significantly quicker than any of the control groups and without any systemic side effects. However the dose lacks a theoretical basis.

Udupa and chansouria stated that histological analysis of wound tissue after using topical insulin showed an earlier appearance of collagen fibres with more dense and well-oriented morphology versus control animals (12)

Achar, et al<sup>[13]</sup> showed that topical use of insulin-like growth factor (IGF-1) in the form of a cream improves wound healing in both diabetic and non-diabetic animals, with increased expression of my fibroblasts.

Yu et al concluded that Topical insulin application significantly changes the expression of insulin signaling-related proteins and expression of Glut1 on wound areas [14].

Zhaoxin et al. in 2015 reported their study on the effects of topical insulin on wound vascularisation in diabetic foot ulcer patients. They have used CD 34 as an indicator for angiogenesis as it is highly expressed in new blood vessels and micro-vessel density (MVD) was calculated based on the expression of CD 34 as a quantitative indicator of angiogenesis.

They have concluded in the end that that on day 5 the CD 34 expression began to increase with no significant difference in MVD and granulation tissue between 2 groups. On day 7 there was significant growth of granulation tissue along with a rapid increase in MVD in consistence with gross and histological observation. They have found that local insulin injection could reduce the blood glucose level in a significant way suggesting a systemic side effect [15]

Abdelkader et al. in 2016 opined in their study that though topical insulin in wound management is not an accepted first line treatment option its use has been hindered by lack of proper delivery vehicle that can deliver insulin reliably to the wound bed at a controlled rate.

A crude application to insulin was found to have some systemic side effects. They have suggested that there is need for formulation of sophisticated delivery systems such a adhesive

films or hydrogels as a promising methods for controlled delivery into wound environment [16].

Though half of the research was done in animals, the studies stated above quotes that using topical insulin in wound bed preparation is safe and effective. It hastens the wound healing thereby reducing hospital stay. It enhances angiogenesis and is associated with increased fibroblasts in wound bed area. Zhaoxin et al. stated that topical insulin application was found to have association with lowering of systemic glucose levels while zhang et al quoted that there were no systemic side effects.

### Conclusion

And so in conclusion, usage of topical insulin in wound bed preparation of a Fournier's gangrene is a new concept, our case report highlights the uses of insulin such as easy availability, cost effectiveness, decreased hospital stay, and few side effects of the treatment. Further more cases are required to be recruited to assess and validate the efficacy of insulin in Fournier's gangrene, as only sparse literature is available in the topic.

### Conflict of Interest Statement-

There is no conflict of interest.

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