Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 06, September, 2025
Website: usajournals.org

TREATMENT OF PATIENTS WITH PURULENT-NECROTIC COMPLICATIONS SYNDROME OF DIABETIC FOOT

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Abstract
The authors proposed a new method of treatment of patients with purulent-necrotic complications of diabetic foot using a hydrosurgery system VERSAJET ™. A comparative analysis of treatment outcomes of two groups of patients with complicated forms of diabetic foot was conducted. For the treatment of patients of the main group was used hydrosurgery method. At patients of the control group surgical approach was determined by conventional methods. Application hydrosurgery system led to a reduction in terms of wound healing, reduce postoperative complications from 37.5% to 7.1%.

Keywords: Diabetic foot syndrome, necrectomy, gidrohirurgicheskaya system VERSAJET™

INTRODUCTION

Complicated diabetic foot syndrome is characterized by angiopathy, polyneuropathy, osteoarthropathy, secondary infection, and inhibition of reparative regeneration, resulting in purulent-necrotic complications in the foot and, subsequently, the entire lower extremity [1, 2]. The incidence of this complication is 4-10% of all patients with diabetes; 85% of diabetic foot

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syndrome cases involve trophic ulcers, as well as their complications (abscess, phlegmon, gangrene), consequences of amputations, and diabetic osteoarthropathy [3, 4].

Half of all lower extremity amputations for non-traumatic lesions are performed in patients with diabetes. In the United States, this translates to 54,000 amputations annually. Clinical studies have shown that 85% of patients in this group developed diabetic foot ulcers [5, 6].

OBJECTIVE OF THE STUDY

The aim of this study was to comparatively examine the effectiveness of the VERSAJET™ hydrosurgical system in the surgical treatment of patients with complicated forms of diabetic foot.

MATERIALS AND METHODS

The study was conducted at the Purulent Surgery Department of Twins Medical Center in Tashkent. Patients with diabetic foot syndrome complicated by various purulent-necrotic lesions of the foot were observed. The control group consisted of 32 patients, while the study group included 28 patients. The location and nature of the lesions were approximately identical in both groups (Table 1).

Table 1. Level of damage in patients in the control and study groups

Indicators	Deep ulcer	Pandactylitis	Phlegmon	Callus abscess
Control group	14	6	9	3
Main group	13	4	9	2

We performed various surgeries on all patients: incision and drainage of phlegmon, necrectomy, and amputation of toes and feet at various levels. In patients in the control group, surgical tactics were determined by conventional methods. In patients in the study group, a hydrosurgical technique was additionally used in surgical treatment.

The use of the hydrosurgical system in patients in the study group resulted in a more rapid transition from the inflammatory phase of the wound process to the reparative phase, which was characterized by the visual appearance of signs of

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granulation in the wounds as early as 5-10 days, a reduction in wound area, and the appearance of epithelialization by 10-14 days. Meanwhile, in patients in the control group, we achieved granulation on average only by 18-24 days. In 37.5% of patients in the control group (12 patients), various complications were observed in the postoperative period, including stump suppuration, which required reamputation and necrosectomy at the foot level. The use of the VERSAJET™ hydrosurgical system reduced the number of repeat surgeries and preserved the weight-bearing function of the foot. In the study group, repeat reamputation was performed in only 2 patients (7.1%).

RESULTS AND DISCUSSION

Purulent-necrotic processes in diabetic foot syndrome are classified by the level of damage [1]:

I. Lesions of the skin itself (superficial ulcer, cutaneous, subungual whitlow).

II. Lesions of the subcutaneous tissue (infected deep ulcer, subcutaneous whitlow, callus abscess, subcutaneous abscess).

III. Lesions of the superficial fascia (purulent dorsal and plantar tendovaginitis, abscess, necrotizing fasciitis, non-clostridial fasciitis, epifascial phlegmon).

IV. Muscle and deep fascial involvement.

Subaponeurotic phlegmon of the plantar and dorsal, lateral, medial, and medial spaces; panphlegmon.

V. Bone and joint involvement (diabetic osteoarthropathy – Charcot joint; osteomyelitis – bone, articular, and osteoarticular).

VI. Gangrene: dry, wet (digital necrosis, gangrene of the foot and leg).

Currently, comprehensive treatment for trophic ulcers and other purulent-destructive processes associated with diabetic foot syndrome includes local wound care, wound infection suppression, carbohydrate metabolism compensation, limb swelling reduction, and, if necessary, detoxification therapy. The primary method is surgical treatment of complicated forms of diabetic foot syndrome. Surgical interventions largely determine the outcome of the treatment, facilitating the relief of general symptoms of infection (opening of purulent

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abscesses, phlegmon, abscesses), rapid wound cleansing (necrectomy), and wound closure.

Necrectomy is crucial in the treatment of purulent-necrotic complications of diabetic foot syndrome. However, there are some complications in the surgical treatment (specifically, necrectomy) of purulent-necrotic processes associated with diabetic foot syndrome. This includes excessive excision of healthy tissue to completely remove necrosis, which leads to additional trauma and further development of the infectious-purulent process, insufficient removal of necrotic tissue and fibrin, and the difficulty of performing necrosectomy in deep lesions, when visualization of necrotic foci is difficult.

In this regard, the use of the VERSAJET hydrosurgical system is of interest for the surgical treatment of patients with complicated forms of diabetic foot.

The VERSAJET™ hydrosurgical system is designed for cutting, destroying, and removing pathological tissue from wounds, as well as for surgical debridement of wounds and soft tissues using a pulsating fluid jet. It is a surgical instrument based on a high-velocity fluid flow, utilizing the advantages of sharp wound debridement and simultaneous pulsating jet debridement (Fig. 1). A high-pressure fluid stream is directed from a nozzle directly into the opening of a tube designed for evacuation of the contents. The unique design of this system creates a localized vacuum, which effectively removes debris, tissue fragments, and fluid from the wound during manipulation. Clear separation and separation of necrosis is observed without traumatizing healthy tissue. At the same time, the fluid jet itself creates sufficient pressure to cut tissues such as skin, muscle, and even cartilage. This allows for the combined effects of excision of nonviable tissue and its simultaneous removal from the wound. The VERSAJET™ hydrosurgical system allows you to select the surgical technique that best suits your specific wound treatment needs, including cleansing, removal of foreign bodies, tissue excision, wound edge shaping, and more.

The device consists of three main components: a hydrosurgical kit, a work console, and a foot switch. The disposable hydrosurgical kit includes a surgical handpiece, a pump cartridge, and a tubing system. The pump cartridge connects to the front panel of the work console, which provides power. The foot switch

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provides remote activation of the work console. The system is designed for use with disposable kits only.

The hydrosurgical kit covers the entire system's operating cycle, from the delivery of sterile saline from the primary container to the pump, from where the high-pressure fluid jet is delivered to the surgical tip;

and ending with the removal of wound debris through the discharge tube into the collection container.

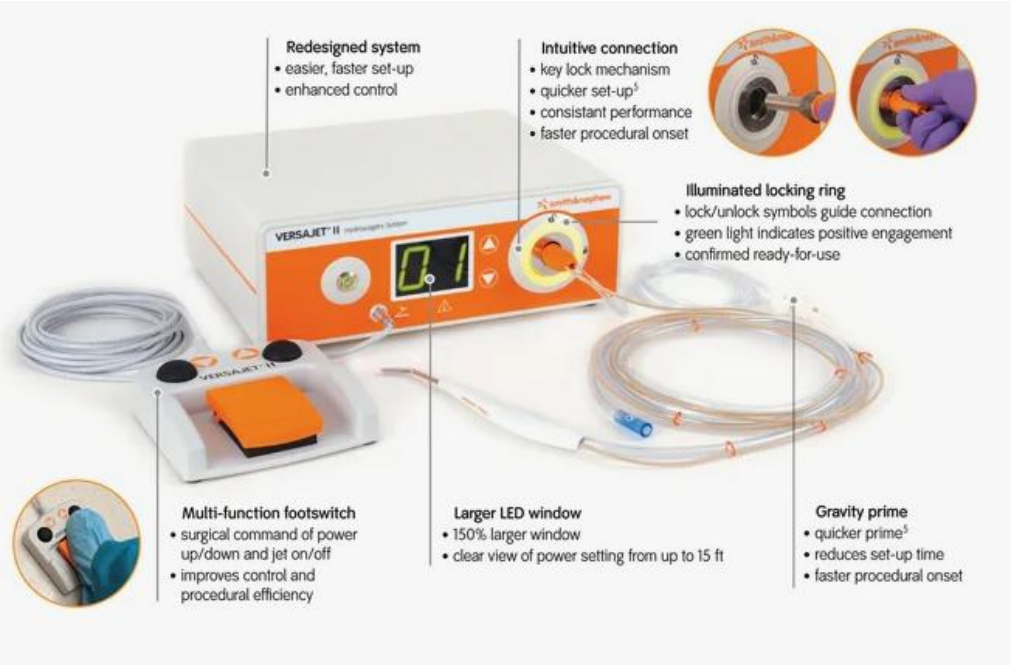

Figure 1. External appearance of the VERSAJET™ hydrosurgical system.

CONCLUSION

We believe that the hydrosurgical method can be used for superficial necrosis, which often develops at the site of already formed granulation tissue.

Using a scalpel in such cases leads to damage to the granulation tissue, while a hydrosurgical method effectively clears the wound of fibrin and superficial necrosis. The use of a hydrosurgical system in the treatment of purulent-necrotic complications of diabetic foot syndrome, compared to classical principles of treating purulent wounds, accelerates the healing process and reduces the number

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of reoperations, as well as achieves complete wound cleansing and preparation for plastic surgery.

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