Application of point of care ultrasound and relevance of anatomy in necrotizing fasciitis

Aplicação do ultrassom point of care e relevância da anatomia na fasciite necrosante

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■ **ABSTRACT**

Introduction: Ultrasound is currently being used in intensive care medicine. When not diagnosed and treated quickly, necrotizing fasciitis has a rapid progression and high mortality. The objective is to present the importance of anatomy in necrotizing fasciitis and the use of ultrasound in early diagnosis. **Methods:** The application of point-of-care ultrasound and the relevance of anatomy in necrotizing fasciitis were presented. **Results:** The anatomical communications between the fasciae of the scrotal, perineal, penile and abdominal regions allow the spread of the infectious process resulting from Fournier's gangrene to the adjacent regions. Ultrasound enabled early diagnosis of necrotizing fasciitis. **Conclusion:** Communications between the fasciae of the scrotal, perineal, scrotal, penis and abdominal regions contributes to the progression of the infectious process resulting from Fournier gangrene and ultrasound permitted earlier diagnose.

Keywords: Fasciitis, Necrotizing; Fournier Gangrene; Wound infection; Anatomy; Ultrasonography.

■ **RESUMO**

Introdução: O ultrassom tem sido utilizado na atualidade na medicina intensiva. A fasciite necrosante quando não diagnosticada e tratada rapidamente apresenta progressão rápida e alta mortalidade. O objetivo é apresentar a importância da anatomia na fasciite necrosante e o uso do ultrassom no diagnóstico precoce. **Métodos:** Apresentou-se a aplicação do ultrassom *point of care* e a relevância da anatomia na fasciite necrosante. **Resultados:** As comunicações anatômicas entre as fáscias das regiões escrotal, perineal, peniana e abdominal permitem a disseminação do processo infeccioso decorrente da gangrena de Fournier para as regiões adjacentes. O ultrassom possibilitou o diagnóstico precoce na fasciite necrosante. **Conclusão:** As comunicações entre as fáscias das regiões escrotal, perineal, peniana e abdominal contribuíram para a progressão do processo infeccioso decorrente da gangrena de Fournier e o ultrassom possibilitou o diagnóstico precoce.

Descritores: Fasciite necrosante; Gangrena de Fournier; Infecção dos ferimentos; Anatomia; Ultrassonografia.

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INTRODUCTION

Necrotizing fasciitis has high mortality rates when diagnosis and treatment do not occur early, particularly in patients with diabetes mellitus and immunosuppression, which are the main risk factors[1-3].

Necrotizing fasciitis resulting from Fournier's gangrene is characterized by ischemia and thrombosis of the subcutaneous vessels of the scrotal region, resulting in necrosis[4-6], which requires debridement[7-9] as soon as the diagnosis is established. Point of care ultrasound has been used successfully in intensive care.

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OBJECTIVE

The study's objectives are to present the application of point-of-care ultrasound in early diagnosis and the relevance of anatomy in necrotizing fasciitis from Fournier's gangrene.

METHODS

The application of point-of-care ultrasound in early diagnosis and the relevance of anatomy in necrotizing fasciitis were studied, through a careful evaluation of the literature, including scientific articles based on PubMed, VHL, SciELO and Lilacs databases, as well as books established in the literature. The descriptors used were: Fasciitis Necrotizing, Anatomy, Ultrasound, Surgery and Plastic Surgery.

RESULTS

Application of point of care ultrasound in the early diagnosis of necrotizing fasciitis

The application of ultrasound in necrotizing fasciitis consisted of using acoustic window concepts to visualize the presence of thickening of the affected fascia associated with gases, which may be present in the first 48 hours of necrotizing fasciitis evolution. The use of ultrasound enabled the early diagnosis of necrotizing fasciitis, followed by initiation of antibiotic therapy and surgical treatment, with a consequent reduction in mortality. (Figure 1).

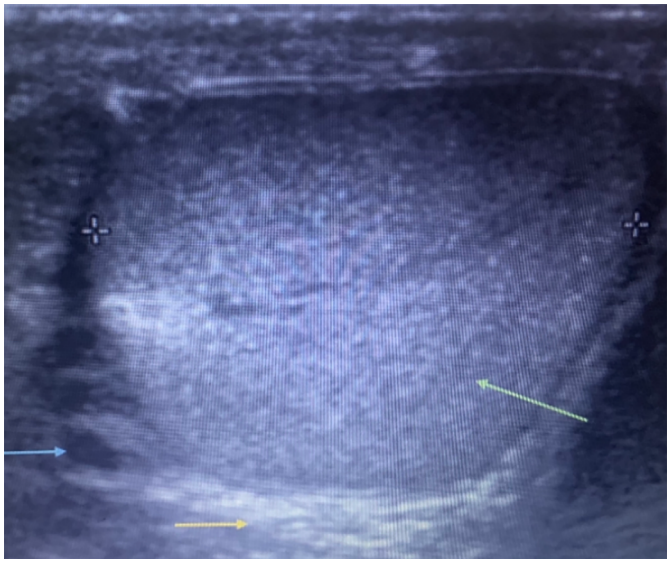

Figure 1. Testicular ultrasound image showing normal testis (green arrow), thickening of the dartos layer (yellow arrow) and gas (blue arrow).
Source: Martins et al.[29]

Relevance of anatomy in Fournier's gangrene

The Colles, Buck, dartos, and Scarpa fascial lining layers represented respectively anatomical communications between the fascial lining layers of the perineal, scrotal, penile, and abdominal regions that contribute to the rapid spread of infection in Fournier's gangrene necrotizing fasciitis. Communication between Buck's scrotal lining layer and Scarpa's lamellar layer in the abdomen occurred through continuity with the fascial lining layer of the inguinal region.

DISCUSSION

The infectious process of necrotizing fasciitis resulting from Fournier's gangrene spreads through the continuity of the fasciae, hence the importance of anatomy. The scrotum, a cutaneous pouch that contains the testes and lower parts of the spermatic cord, is made up of two layers, one of skin, superficially, and the other of a thin layer, the dartos, which, anatomically, consists of a layer of smooth muscle, located under the skin of the scrotum. In women, this musculature is less developed and is called dartos mulierbris, being under the skin of the labia majora[3,4].

Dartos communicates with the superficial muscular fascia of the perineum called Colles' fascia, which lines the muscles of the superficial portion of the perineum. The fascia that lines the cavernous bodies of the penis is called Buck's fascia. Colles' fascia of the perineum has anatomical continuity with Scarpa's fascia, the deep layer of the abdominal wall lining[4,5]. The important communication between Colles' fascia, dartos, Buck's fascia and Scarpa's fascia is responsible for the rapid spread of the infectious process initiated in the perineal-scrotal region to the penis and the abdominal wall in the most severe cases.

The delay in defining the diagnosis, late initiation of treatment[6,8], diabetes mellitus and immunosuppression[6-8] were conditions related to increased mortality in Fournier's gangrene. Imaging methods, such as ultrasound and computed tomography, are important diagnostic aids[9,10]. The pathophysiology of Fournier's necrotizing fasciitis is characterized by vessel ischemia and thrombosis, resulting in fascial necrosis[11,12]. After ischemia and thrombosis, bacteria spread, and the anaerobic gas-producing bacteria are responsible for the crepitus found in the first 48 hours of infection[13], which can develop under the apparently normal skin[14,15].

The most prevalent microorganisms are Escherichia coli, Staphylococcus aureus, Bacteroides fragilis and Streptococcus fecalis[13-17]. Reducing the mortality rate depends on early diagnosis and rapid initiation of treatments with broad-spectrum antibiotics[18-21], debridement of necrotic tissues[1,22-24] and the association of hyperbaric therapy[25-29].

The application of ultrasound has shown great growth today, especially in anesthesia and intensive care. In anesthesia, ultrasound has helped to locate nerves during peripheral blocks. In intensive care medicine and trauma, ultrasound is highlighted in diagnosing pleural effusion, pneumothorax and cardiac alterations during cardiogenic shock[30-32]. In the present study, the application of ultrasound was important in the early diagnosis of necrotizing fasciitis, enabling the rapid initiation of treatment.

CONCLUSION

Anatomical communications between the lining layers of the perineum, scrotum, penis, inguinal, and abdomen regions contribute to the progression of infection in Fournier's gangrene necrotizing fasciitis. The application of ultrasound allowed the early diagnosis of infection in necrotizing fasciitis, allowing the rapid initiation of treatment with antibiotic therapy and surgical treatment.

COLLABORATIONS

RLF Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Resources, Software, Supervision, Validation, Visualization, Writing - Original Draft Preparation.

LCL Final manuscript approval, Investigation, Methodology, Resources, Validation, Visualization, Writing - Review & Editing.

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