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Review

The burn wound exudate—An under-utilized resource

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ARTICLE INFO

Article history:
Accepted 4 June 2014

Keywords:
Burn fluid
Exudate
Blister
Cytokines
Subeschar fluid
Diagnostics

ABSTRACT

Introduction: The burn wound exudate represents the burn tissue microenvironment. Extracting information from the exudate relating to cellular components, signaling mediators and protein content can provide much needed data relating to the local tissue damage, depth of the wound and probable systemic complications. This review examines the scientific data extracted from burn wound exudates over the years and proposes new investigations that will provide useful information from this underutilized resource.

Method: A literature review was conducted using the electronic database PubMed to search for literature pertaining to burn wound or blister fluid analysis. Key words included burn exudate, blister fluid, wound exudate, cytokine burn fluid, subeschar fluid, cytokine burns, serum cytokines. 32 relevant articles were examined and 29 selected as relevant to the review. 3 papers were discarded due to questionable methodology or conclusions. The reports were assessed for their affect on management decisions and diagnostics. Furthermore, traditional blood level analysis of these mediators was made to compare the accuracy of blood versus exudate in burn wound management. Extrapolations are made for new possibilities of burn wound exudate analysis.

Results: Studies pertaining to burn wound exudate, subeschar fluid and blister fluid analyses may have contributed to burn wound management decisions particularly related to escharectomies and early burn wound excision. In addition, information from these studies has the potential to impact on areas such as healing, scarring, burn wound conversion and burn wound depth analysis.

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http://dx.doi.org/10.1016/j.burns.2014.06.002

Conclusion: Burn wound exudate analysis has proven useful in burn wound management decisions. It appears to offer a far more accurate reflection of the burn wound pathophysiology than the traditional blood/serum investigations undertaken in the past. New approaches to diagnostics and treatment efficacy assessment are possible utilizing data from this fluid.

Burn wound exudate is a useful, currently under-utilized resource that is likely to take a more prominent role in burn wound management.

Contents

1. Introduction

Exudate is a liquid produced by the body in response to tissue injury. In general wound management, much information has been gleaned from the wound exudate, particularly related to chronic wounds. In fact, new approaches to the treatment of chronic wounds have been directed at the wound exudate to influence wound healing [1]. The wound exudate is regarded as a reflection of the wound bed physiology. In much the same way, the burn wound, the ultimate inflammatory injury, creates an exudate that represents the burn tissue microenvironment. Extracting information from the exudate relating to cellular components, signaling mediators and protein content can provide much needed data relating to the local tissue damage, depth of the wound and probable systemic complications. In this regard the exudate may be the first indicator of possible systemic complications to which the patient with significant burn injury is predisposed. Systemic inflammatory response syndrome (SIRS) and subsequent multiorgan failure is thought by many authors to be related to the outpouring of cytokines from the burn wound into the blood stream [2–9] (added more references here). Thus, the burn wound exudate should be the logical area for early analysis of cytokine levels.

The exudate examination is likely to provide a more accurate reflection of the burn injury than the traditional analysis of blood levels, which we view as a lagging indicator. The limited literature pertaining to burn exudate analysis already provides useful information for burn assessment and management, but the explosion of molecular biological knowledge should enable us to glean significantly more relevant data from this useful resource. This review examines the scientific data extracted from burn wound exudates over the years and proposes new investigations that will provide very useful information extracted from this underutilized resource.

2. Methodology

A literature review was conducted using the electronic database PubMed to search for literature pertaining to burn wound or blister fluid analysis. Key words used for the search included – burn fluid; burn wound exudate; blister fluid; burn cytokines; sub eschar fluid; Thirty two papers relevant to the search topic were selected and analyzed based on the fact that they specifically utilized burn wound exudate as their diagnostic or testing resource. Additionally some studies that utilized traditional blood/serum investigations of pathophysiologic markers were selected as a basis of comparison with exudate diagnostics. These reports were assessed for their affect on management decisions and diagnostics. Furthermore, traditional blood level analysis of these mediators was made to compare the accuracy of blood versus exudate in burn wound management. Extrapolations are made for new possibilities of burn wound exudate analysis.

3. Results: historical data gleaned from burn wound fluid/exudate

Data accumulated from the study of burn wound fluid has had an important influence on management decisions pertaining to burn injuries. Early investigations on this exudate that accumulates below the eschar demonstrated toxic, immunosuppressive and pro-inflammatory traits that may have reinforced surgeons decisions to perform early escharotomy/escharectomy [10]. In contrast, other studies showed protective and positive wound healing effects of this fluid, particularly in early blisters [11]. Merging current knowledge with the experiences of the past, we seek to develop a logical narrative and explore possible new useful burn wound exudate diagnostics. First, it is relevant to explore the