



Universiteit
Leiden
The Netherlands

Multidimensional aspects of burn wound treatment

Rashaan, Z.M.

Citation

Rashaan, Z. M. (2020, October 6). *Multidimensional aspects of burn wound treatment*. Retrieved from <https://hdl.handle.net/1887/137568>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/137568>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/137568> holds various files of this Leiden University dissertation.

Author: Rashaan, Z.M.

Title: Multidimensional aspects of burn wound treatment

Issue Date: 2020-10-06

Appendices

Summary

Nederlandse samenvatting

List of publications

Dankwoord

About the author

SUMMARY

This thesis focuses on the optimization of burn wound treatment by a multidimensional approach of burn wound management. The thesis comprises four parts. The first part examines the clinimetric properties (feasibility, validity and reliability) of three-dimensional imaging for measuring of wound surface area and percentage of the total body surface area (%TBSA). The second part evaluates treatments of partial thickness burns in paediatric patients. The third part is devoted to the FLAM study where two commonly used treatments (Flaminal® Forte versus Flammazine® for partial thickness burns in adult patients were compared with regard to clinical effectiveness, scar formation, quality of life and cost-effectiveness. Finally, the course of different properties of scar formation was explored and factors that influence these properties of scar formation from the patients' perspective were studied.

Part I: Clinimetric studies on three-dimensional imaging

Burn wound size estimation, defined as %TBSA, is an essential part of burn wound management. %TBSA is used as a criterion for whether a burn patient must be transferred to a specialized burn unit, for the need for and the volume of intravenous fluid resuscitation and management of nutritional support, for which initial local wound treatment to start and for the evaluation of the treatment effectiveness. However, the reliability of methods that are used in clinical practice to estimate %TBSA are highly dependent on the experience of the physician, size and irregularity of the wound and the body mass index of the patient.

In **Chapter 2** and **3**, thorough clinimetric evaluations of three-dimensional imaging to measure wound surface area and estimate %TBSA with the Artec MHT™ Scanner and software were performed. Three-dimensional imaging found to be a valid technique to measure wound surface area. However, the validation of this technique also depends on a valid measurement of the body surface area (BSA) since %TBSA is calculated by dividing the wound surface area by the body surface area (BSA) x 100. BSA was obtained from two commonly used formulae in the field of medicine, the duBois & duBois formula (for adults) and the Haycock formula (for children), while validation studies of these formulae are rare in the literature. Therefore, more studies are needed to validate formulas to calculate BSA since the validity of %TBSA mainly depends on these formulas.

Furthermore in **Chapter 2** and **3**, it was illustrated that three-dimensional imaging is a reliable method to estimate wound surface area and %TBSA. Additionally, in **Chapter 3**, the reliability of three-dimensional imaging using the Artec MHT™ Scanner and software was found to be superior compared to the reliability of the rule of nine or the palm method that are used by physicians in clinical practice. In terms of feasibility, the Artec MHT™ Scanner and software

were found to be easy to use although post-processing the data and measurement of the wound surface area may take a long time: between 15 to 60 minutes depending on the size of the burn wound. In short, three-dimensional imaging using the Artec MHT™ Scanner and software is a novel and promising technique to overcome the limitations of methods used in current clinical practice, while the feasibility of this method requires improvements before this method can be implemented in daily clinical practice.

Part II: Partial thickness burn in paediatric patients

A wide range of treatment modalities are available in the treatment of partial thickness burns in paediatric patients, while currently there is no consensus on which treatment is the gold standard. Silver sulfadiazine (SSD), such as (Flammazine®), is widely used in the treatment of partial thickness burns in paediatric patients due to its easy application on the burn wounds and excellent anti-microbial properties, although dressing changes with SSD are often painful and prolonged use of SSD leads to delayed wound healing.

In **Chapter 4**, a systematic review and meta-analysis of the literature are reported that compared the clinical effectiveness of SSD to nonsilver treatment for partial thickness burns in paediatric patients. It was demonstrated that nonsilver treatment may be preferred over SSD with regard to wound healing time, number of dressing changes, pain, and length of hospital stay (LOS), whereas no treatment differences were found in terms of infection and number of graft procedures.

Chapter 5 represents an observational, prospective study on the usability and clinical effectiveness of Suprathel® in the treatment of partial thickness burns in paediatric patients. Suprathel® is a water-soluble, non-animal derived synthetic burn wound dressing that only requires outer layer dressing changes. This study demonstrated that Suprathel® has potential advantages with regard to scar formation and pain, due to minimal wound bed manipulation during dressing changes, when compared with the available literature on (semi)synthetic dressings in the treatment of partial thickness burns in paediatric patients. However, this study showed also that an extensive wound debridement (for example by using Versajet® hydrosurgery) was necessary for the optimal adherence of Suprathel® on the wound bed. This study found no better outcomes for wound healing, need for grafting, wound colonisation and infection compared to the available literature. We recommend to use Suprathel® in the treatment of partial thickness burns in paediatric patients only if an extensive wound debridement is warranted. Additionally, comparative studies are needed to study the clinical effectiveness of Suprathel® in the treatment of partial thickness burns in paediatric patients.

Part III: Partial thickness burn wounds in adult patients

The advances in burn wound treatment in the last decades did not lead to a gold standard in the treatment of partial thickness burn wounds in adult patients. In the Netherlands, SSD is a popular modality in burn wound treatment while in Belgium Flaminal® Forte is frequently used in the treatment of partial thickness burns. Before this thesis, no prospective comparative study had been performed to help the physicians to choose between these two treatment strategies for the treatment of partial thickness burns.

Therefore, a randomized controlled trial (RCT) was performed to study the differences between Flaminal® Forte and treatment with SSD alternated with Furacine Soluble Dressing, based on the multidimensional aspects of modern management of burn wounds that includes clinical-effectiveness, scar quality, quality of life and cost-effectiveness (FLAM study). **Chapter 6** presents the study protocol of this RCT. In **Chapter 7**, the results of the clinical effectiveness and scar formation of the FLAM study are presented. In this study no statistically significant difference in wound healing was found between both treatment groups, while the incidence of wound colonization was much higher in the Flaminal® Forte group compared with the SSD group. With regard to scar formation, no differences were found between both treatment groups, while scar formation improved during follow-up of twelve months post-burn for both treatment groups.

Chapter 8 provides the results of health-related quality of life and cost-effectiveness of the FLAM study. There were no statistically significant or clinically relevant differences in health-related quality of life between the treatment groups. Most importantly, the health-related quality of life was similarly high in both treatment groups and improved during a follow-up of twelve months post-burn. This indicates that both treatment strategies are excellent to achieve good health-related quality of life. Treatment with Flaminal® Forte was not found to be cost-effective compared with SSD despite less dressing changes in the Flaminal® Forte group for several reasons. There was more wound colonisation in the Flaminal® Forte group that required daily dressing changes and the unit price of Flaminal® Forte was higher compared with SSD. Additionally, it was brought to light that the total healthcare costs and non-health costs (societal costs) in both treatment groups were largely determined by the costs of burn center stay and absence from work and in third place by the treatment costs, which were less than 6% in both treatment groups.

Overall, Flaminal® Forte and alternated treatment with SSD/ Furacine Soluble Dressing were comparable in terms of wound healing, scar quality, HRQoL and costs. However, treatment with Flaminal® Forte is to be preferred because it requires less dressing changes and therefore lowers the burden of wound care in burn patients. However, the role of wound colonisation in both treatment groups should be further studied in future research.

Part IV: Scar formation: patterns and predictors

The last part of this thesis describes the course of different properties of scar formation, measured with the POSAS patient scale, and the influence of various predictors on these scar properties at three, six and twelve months post-burn from the perspective of 284 paediatric and 190 adult burn patients. In **Chapter 9** with the exception of relief, all other aspects measured with the POSAS patient scale (pain, pruritus, color, pliability and thickness) improved during the first twelve months post-burn, while the degree of improvement was not the same for all these aspects. Female patients, age younger than 5 years, large burn wounds, full-thickness burns and flame burns were found to be predictors of worse scores on various POSAS patient items.

The results of the study described in **Chapter 9** can be used to inform burn patients and clinicians about the natural course of different properties of scar formation and factors that influence these scar properties. This information can ultimately be used for therapeutic and personalized follow-up strategies. However, larger studies are warranted to strengthen our results.