Eschar Removal by Bromelain based Enzymatic Debridement in Burns: European Consensus Guidelines Update

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Introduction:

Bromelain-based Enzymatic Debridement has been introduced as an additional concept to the burn surgeon's armamentarium and is best indicated for mid-to deep dermal (≈deep partial-thickness) burns with mixed patterns. Increasing evidence has been published focusing on special regions and settings as well as on limitations of Enzymatic Debridement to improve patient care. To better guide Enzymatic Debridement in view of the increasing experience, there is a need to update the formerly published consensus guidelines with user-orientated recommendations, which were last produced in 2017.

Method:

A multi-professional expert panel of plastic surgeons and burn care specialists from twelve European centers and ten European nations was convened in Frankfurt/Germany in March 2019, to assist in developing current recommendations for best practices with use of Enzymatic Debridement. Consensus statements were based on peer-reviewed publications and clinical relevance, and topics for re-evaluation and refinement were derived from the formerly published European guidelines. For consensus agreement, the methodology employed was an agreement algorithm based on a modification of the Willy and Stellar method. For this study on Enzymatic Debridement, consensus was considered when there was at least 80 % agreement to each statement.

Conclusion:

The updated guidelines in this publication represent further refinement of the recommended indication, application and post-interventional management for the use of Enzymatic Debridement. The published statements contain detailed, user-orientated recommendations aiming to align current and future users and prevent pitfalls, e.g. for the successful implementation of the concept in further countries like the USA. The significance of this work is reflected by the magnitude of patient experience behind it, larger than the total number of patients treated in all published clinical trials.

Applicability of Research to Practice:

These consensus guidelines serve as refined user-orientated recommendations for implementation and successful application of Enzymatic Debridement based on the available evidence and experience of 1232 summarized patient cases.

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Disclosures:

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Dr. Almeland has no conflicts of interest to declare.
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Results:

The updated consensus guidelines from 2019 refer to the clinical experience and practice patterns of 1232 summarized patient cases treated by the panelists with ED in Europe (2017: 500 cases), reflecting the impact of the published recommendations. Forty-three statements were formulated, addressing the following topics: indications, pain management and anesthesia, large surface treatment, timing of application for various indications, preparation and application, post-interventional wound management, skin grafting, outcome, scar and revision management, cost-effectiveness, patient´s perspective, logistic aspects and training strategies. The degree of consensus was remarkably high, with consensus in 42 out of 43 statements (97.7%). A classification with regard to timing of application for Enzymatic Debridement was introduced, discriminating immediate/very early (≤12h), early (12-72h) or delayed (>72h) treatment. All further recommendations are addressed in the publication.

Table 1: Indications for Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
1	Classifications with regard to timing of application for ED are „immediate/ very early"(≤12h), early (12-72h) or delayed (>72h).	12/12 (100%)	0/12 (0%)	Yes
2	ED might be less effective in scald injuries.	12/12 (100%)	0/12 (0%)	Yes
3	There is not enough evidence to recommend ED for chemical burns.	12/12 (100%)	0/12 (0%)	Yes
4	Outpatient treatment/ED as a day case can be performed after careful patient selection in minor burns in experienced burn centers.	9/12 (75%)	3/12 (25%)	No
5	Repeated application of ED can only be recommended in exceptional cases.	12/12 (100%)	0/12 (0%)	Yes
6	ED is best indicated for mid-to deep dermal burns with mixed patterns.	12/12 (100%)	0/12 (0%)	Yes
7	ED can be applied in full thickness burns.	12/12 (100%)	0/12 (0%)	Yes
8	Application of ED as early as possible during admission can prevent burn related compartment syndrome in circumferential extremity burns.	12/12 (100%)	0/12 (0%)	Yes
9	ED applied as early as possible during admission might prevent development of burn induced compartment syndrome in extensive trunk burns.	12/12 (100%)	0/12 (0%)	Yes
10	ED cannot replace surgical release for extended trunk burns in case of established respiratory compromise.	12/12 (100%)	0/12 (0%)	Yes
11	ED is not recommended in the extremity in case of established compartment syndrome and high voltage injury.	12/12 (100%)	0/12 (0%)	Yes

Table 2: Application of Enzymatic Debridement of Special Regions

No.	Consensus Statement	Yes	No	Consensus
12	ED treatment of burns on the palm or sole might be indicated in selected patients but requires specific mechanical treatment	12/12 (100%)	0/12 (0%)	Yes
13	ED is highly recommended for facial burns.	12/12 (100%)	0/12 (0%)	Yes
14	Orifices of the face require special protection measures to prevent from contact with product.	12/12 (100%)	0/12 (0%)	Yes
15	Ophthalmological exam after facial burns is recommended prior to and after ED treatment.	12/12 (100%)	0/12 (0%)	Yes
16	ED is recommended for perineal and genital burns.	12/12 (100%)	0/12 (0%)	Yes

Table 3: Imaging prior/after Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
17	LDI is a helpful tool for identification of regions that require ED.	12/12 (100%)	0/12 (0%)	Yes
18	At the moment there is no evidence to support LDI after ED.	11/12 (91.7%)	1/12 (8.3%)	Yes

Table 4: Pain Management and Anesthesia for Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
19	Regional anesthesia is recommended for ED of the isolated (upper/lower) burnt extremity.	12/12 (100%)	0/12 (0%)	Yes
20	Local anesthesia for ED is useful in minor burns.	12/12 (100%)	0/12 (0%)	Yes

Table 5: Enzymatic Debridement for Large Surface Area Treatment

No.	Consensus Statement	Yes	No	Consensus
21	Sequential ED procedures for larger TBSA are possible with up to 15% TBSA per session.	12/12 (100%)	0/12 (0%)	Yes
22	ED of more than 15% BSA/session requires adequate monitoring and hemodynamic support and is considered as an off-label use.	12/12 (100%)	0/12 (0%)	Yes

Table 6: Timing of Enzymatic Debridement Application

No.	Consensus Statement	Yes	No	Consensus
23	Late Application (>72 hours from injury) is possible in selected wounds after appropriate prolonged presoaking	12/12 (100%)	0/12 (0%)	Yes

Table 7: Preparation and Application of Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
24	Coagulopathy has to be treated prior to ED.	12/12 (100%)	0/12 (0%)	Yes
25	Hydrogel dressings can be used as an effective moisturizer to for dry eschar to improve pre-soaking.	12/12 (100%)	0/12 (0%)	Yes
26	Pre-Soaking can be scheduled overnight to synchronize the ED application with the day shift team.	12/12 (100%)	0/12 (0%)	Yes
27	Pretreatment with silver sulfadiazine or betadine should be avoided	12/12 (100%)	0/12 (0%)	Yes
28	Persistent dry eschar after pre-soaking requires superficial surgical debridement prior to ED.	12/12 (100%)	0/12 (0%)	Yes
29	Shortening of the application time of the product <4hours cannot be recommended.	11/12 (91.7%)	1/12 (8.3%)	Yes

Table 8: Post-interventional Wound Management after Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
30	Immediate post-ED wound bed color, bleeding patterns and 3D morphology should be assessed by an experienced burn surgeon.	12/12 (100%)	0/12 (0%)	Yes
31	A management plan with regard to further treatment modalities should be directly defined after ED by an experienced burn surgeon.	12/12 (100%)	0/12 (0%)	Yes
32	Membrane dressings and allografts can be applied after wet-to-dry phase in wounds that are expected to heal without autografting.	12/12 (100%)	0/12 (0%)	Yes
33	Allografts can be applied temporarily in wounds that are not expected to heal spontaneously after ED prior to autografting.	12/12 (100%)	0/12 (0%)	Yes
34	Indication for administration of antibiotics in the context is equivalent to surgical eschar removal.	12/12 (100%)	0/12 (0%)	Yes

Table 9: Autologous Skin Transplantation after Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
35	In case of full thickness burns after ED, autologous skin grafting should be delayed for at least 2 days.	12/12 (100%)	0/12 (0%)	Yes
36	Deep dermal burn wounds may benefit from early autografting.	12/12 (100%)	0/12 (0%)	Yes
37	Autologous skin grafting should be considered after 21 days if there is no significant progress in epithelization.	11/12 (91.7%)	1/12 (8.3%)	Yes

Table 10: Outcome, Scars and Revision Management after Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
38	Scar treatment and prevention of hypertrophic scars is performed according to established standard protocols in burn care (Compression garments, silicon and abstention from UV-radiation).	12/12 (100%)	0/12 (0%)	Yes
39	Prolonged conservative treatment after ED may result in unstable scarring with intensive wound care, and regular reconsideration should be given for autografting.	12/12 (100%)	0/12 (0%)	Yes

Table 11: Cost-effectiveness of Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
40	ED may help to reduce usage of resources (blood products, surgery, OR room capacity, human resources)	12/12 (100%)	0/12 (0%)	Yes

Table 12: Patient´s perspective on/after Enzymatic Debridement

No.	Consensus Statement	Yes	No	Consensus
41	Data on the patient´s experience on ED are rare and future research on patient experience is needed.	12/12 (100%)	0/12 (0%)	Yes

Table 13: Logistic aspects for implementation and Training strategies/ learning curve

No.	Consensus Statement	Yes	No	Consensus
42	ED can be performed in the operating theatre, intensive care unit or regular ward dependent on the TBSA treated and the anesthesia regimen.	12/12 (100%)	0/12 (0%)	Yes
43	ED is a specialist procedure that requires specific training, adaption to infrastructure as well as multiprofessional involvement.	12/12 (100%)	0/12 (0%)	Yes

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