Response to Vercelli et al. Re: "Physical Management of Scar Tissue: A Systematic Review and Meta-Analysis"

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Comments to the Author

Letter to the Editor and Response

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We thank Vercelli and his colleagues for their interest in our study[1] and welcome the opportunity to respond to their letter to the editor. As detailed in our study, the primary aim of our meta-analysis was "to evaluate the effectiveness of physical scar management on different symptoms in adults with any kind of scar tissue".[1]

Vercelli and colleagues claim, that psychometric scales need to have a minimum of three items to enable the assessment of reliability and internal reliability[2] and that we mostly used single-item ordinal scales or separate items of the Vancouver Scar Scale (VSS). Further, Vercelli and colleagues state that the VSS scale has several pitfalls[3,4] such as poor inter-rater reliability and that a categorical item (pigmentation) cannot be used numerically. Further, if an included RCT used a modified version of the VSS, we should have indicated this specifically in our meta-analysis.

There are indeed different versions of the VSS with a low inter-rater reliability. In the study of Tyack et al.[5], Table 1 provides an overview of clinimetric properties of burn scar scales. Table 2 is a guide to choose an appropriate burn scar scale according to the patient's situations.[5] The clinimetric properties of all scar scales are limited and indeed, the VSS lacks patient perception and the pigmentation subscales are less applicable to large heterogenous scars.[6] This does not mean we should not use these scales. The VSS is perhaps the most recognized burn scar assessment used in literature[7,8] and is recommended for evaluating a scar on two or more time points (longitudinal) in adults. Therefore, the VSS remains widely applicable to evaluate therapy and to measure outcomes in burn studies.[6] Further, Scar scales are cheap and accessible to almost everyone in the professional field to monitor the evolution of a scar tissue healing.[9]

We agree that there is a need for studies using more objective and reliable outcome measures in the management of scar related issues. Nevertheless, a meta-analysis is based on already existing studies and reflects on the used methods and outcome variables of the included clinical trials.

Regarding the fact that several RCTs included in our meta-analysis used a modified version of the original VSS[10-12], we agree that more specified information about the VSS version used, would have been appropriate.

In their letter to the editor, the authors state, that the healing process of a scar depends on the time elapsed since its formation, and the same effect size can have different meanings depending on whether the treatment was prompt or delayed.

We agree that the wound healing depends on the time factor but also on the type of scar. However, many studies do not take this heterogeneity in scar formation into account. Mechanical loading, inflammation, bacterial colonization, and foreign-body reactions are potential factors thought to underlie human hypertrophic scar formation.[13] Histological investigations confirm, that different scar types result in different length of wound healing. For example, in comparison to normal scar tissue, hypertrophic scars and keloids show a higher fibroblast density.[14] Keloids in addition, show higher proliferation rates of fibroblasts and a lack of myofibroblasts, which play a role in the regulation of primary wound contraction.[14] Also, different body parts exhibit different mechanical environments, from very dynamic like at the joint, to an almost static environment in other body parts. The numerous intervention possibilities, and the heterogeneity of a scars after trauma, surgery or burns make late stage clinical research in this field a search for a needle in a haystack. Studying this problem under controlled in vivo conditions and evaluating the outcome on a cellular level, instead of physical or physiological non-invasive assessments would be an important step forward in this field of research. The present study[1] focused on giving an overview of conservative scar management strategies and its effects on scar tissue in all kind of scars and not to evaluate the timing of scar treatment.

Finally, Vercelli and colleagues state that scar adhesions can induce major dysfunctions and that assessments of impairment and disabilities caused by scar adhesions were not included in the present

meta-analysis.[1] Further they refer to a reliable and responsive tool, the "Adheremeter", which already exists to measure scar adhesions.[15]

With regards to our search strategy, we included all outcome parameters comprising subjective and/or objective scar/burn tissue evaluations and did not limit our search to "pliability". Nevertheless, the term pliability is a widely used outcome in the literature and is defined as "the mechanical property of the skin's firmness and extensibility that reflects both the morphological and physiological properties of the scar".[16,17]

The study of Brusselaers et al. describes the most important variables assessed by scar scales.[9] Adhesion is not included as an outcome variable. In a second study of Brusselaers et al. they provide an overview of objective scar measures in 4 categories: Color evaluation, metric variables, biomechanical properties and pathophysiologic disturbances.[18] Biomechanical properties are elasticity or stiffness, acoustic methods and disability methods. The elasticity of the skin is the property to return to its original shape, when the stress is removed which caused deformation (e.g. external forces). Measurement methods that are used are: Suction methods, pressure methods, torsion methods, extension method.[19-21]

Indeed, there is a lack of consensus in the methods and tools used for the measurement of biomechanical properties of scars, both clinically and in research.[22,23] Instead, a variety of measurement methods are reported, each with varying degrees of objectivity. Methods and tools vary, and data obtained are often reported in an inconsistent manner.[22]

Therefore, "pliability" is a collective term that includes scar adhesions. We know that there are some contradictory opinions that state that pliability and adherence might not be the same due to the mechanical properties, but again this would have not affected our outcome of the literature search.[24]

We agree that more objective tools to evaluate scar parameters are needed, nevertheless up to our knowledge until now, no clinical RCT used the "Adheremeter" as an assessment tool to evaluate intervention effects. Therefore, the "Adheremeter" as an assessment tool did not appear in the outcome of our literature search. Moreover, our meta-analysis focused on the outcome of existing physical scar management interventions and not on existing scar assessment methods.

The "Adheremeter" is a reliable and responsive tool and could be a promising device in clinical practice because of the easy handling and the low costs. Nevertheless, since it is also linked to the patient's

judgement of comfort and the rater's evaluation of force to stretch the skin, the measurement of scar adhesion with this tool still includes a subjective component.[15]

As the "Adheremeter" was validated from Ferriero et al.[15] on post-surgical scars, further high quality RCTs are needed that use this tool to evaluate the effectiveness of different interventions on different kind of scar types.

Thus, while we do not discount their point of view, the mentioned arguments of the letter to the editor from Vercelli and colleagues were not our research question.

Statement of ethics

As this is a response to a letter to the editor, no ethical approval by a Research Ethics Board was required.

Disclosure statement

The authors have no conflicts of interest to declare.

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Author contributions

All authors were responsible for drafting and providing final approval of the version to be published and agree to be accountable for all aspects of the work.

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