The alternative approach proposed by Xue *et al.*— using a larger face mask to rule out reduced contact with the cheeks—is an interesting one. We would like to see a demonstration of the effectiveness of this proposed technique in reducing air leaks. Why not share our interest in this topic by conducting a multicenter trial?

We also thank Roth for his comments. Based on his experience, he reports that, in some patients, lower lip face mask placement with the cephalad end of the mask on the eyes may cause ocular damage. Roth recommends using the head straps to improve contact between the mask and cheeks.

In our own experience, we have found that the head straps themselves may promote ocular damage and, therefore, should be used with caution. Also, we are convinced that the problem of air leak at the cheeks is best solved by moving the contact points rather than increasing pressure. However, as airway obstruction contributes to air leak, we fully agree with Roth that the use of an oral airway is one of the keys to improving face mask ventilation in edentulous patients.

Why not conduct a formal comparison among head-strap–adjusted face masks, larger face masks, and lower lip positioning of masks in edentulous patients?

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Why Do Similar Studies Conclude Differently When They Are Performed with Nearly the Same Protocol and the Same Skin Conductance Technology and on the Same Population of Patients?

To the Editor:
In the article by Choo *et al.*[1] on skin conductance fluctuations (SCFs) and postoperative pain in children, the conclusions are different compared with those of the article by Hullett *et al.*[2] on skin conductance as a measure of postoperative pain, even though the authors use the same technology on the same population of patients. How come? The SCFs that are studied mirror the bursts in the skin sympathetic nerves. The bursts in the skin sympathetic nerves are

more specific and sensitive for monitoring pain and noxious stimuli than blood pressure and heart rate because they are not influenced by temperature changes or changes in microcirculation and because acetyl choline acts on the muscarine receptors.[3] It reacts within 1–2 s.[3] Moreover, patients/volunteers without pain/noxious stimuli and other stressors have a low variation between individuals regarding SCFs per second.[3] In awake patients, it is well-known that pain[4,5] and other emotional stressors (*e.g.*, vomiting, nausea, and intellectual tasks, such as explaining and teaching children how a pain score works [used by Choo *et al.*]),[1,6,7] may influence the SCFs per second when monitoring pain. Therefore, correlation tests, such as those that Choo *et al.* have performed, should not be used in the postoperative setting to study pain by SCFs per second if the patients are not controlled for stressors other than pain. Cutoff values to discover the level of pain (*i.e.*, no or mild, moderate, and severe pain) should be used instead.[2,8–11] The cutoff value to discover moderate and severe pain of 0.1 SCFs/s when using a 15-s analyzing window gave a sensitivity to discover moderate and severe pain of 90% and a specificity of approximately 65–70%.[2,9] To use a cutoff value based on optimized sensitivity and specificity, as Choo *et al.* performed in their study, does not make sense as long as the specificity to pain is known to be weak in awake patients. Therefore, it would make more sense to use cutoff values to show whether the skin conductance method can predict no/mild or severe pain with high specificity because moderate pain will most likely be mixed with the other stressors (fig. 3 in the article by Choo *et al.*). Moreover, the analyzing window is important. The nature of postoperative acute pain is often short lasting (*i.e.*, lasting only a few seconds) and occurs during movement. When using pain and anxiety scores, they are often the result of the maximum score in the time window analyzed. If the SCFs per second increase during acute pain, lasting for a few seconds, this increase will be averaged when an analyzing window of 60 s is used. These are exactly the findings from Choo *et al.* (fig. 2 in their article): during no/mild pain (few SCFs per second are expected, left part of the figure), a 15-s analyzing window gave fewer SCFs per second compared with a 60-s analyzing window. Moreover, during severe pain (high SCFs per second are expected, right part of the figure), a 15-s analyzing window gave higher SCFs per second compared with the 60-s analyzing window. Therefore, it is difficult to understand why Choo *et al.* chose and recommended a 60-s analyzing window. Interestingly, Hullett *et al.* used an analyzing window of 15 s and a cutoff value of 0.13 SCFs/s to discover moderate and severe pain in children; the sensitivity for discovering pain was 90%, and the specificity was 64%.[2] The predictive value for discovering no or mild pain, with a cutoff of 0.13 SCFs/s, was 97%.[2] These results indicate how skin conductance technology can be used: physicians and nurses obtain an indication for when to ask patients about their pain status. It is important to know when to ask patients about their pain status, especially in the United States, where it is

mandatory to monitor pain (Joint Commission on Accreditation of Health Care Organizations).[3] With the high predictive value of discovering no and mild pain (97%), the skin conductance monitor may possibly help to at least give less analgesia to patients with no pain and facilitate work in the hospitals when the physicians and nurses know when to ask patients about their pain status.

It would be interesting if Choo *et al.*[1] reanalyzed their data and used a 15-s analyzing window, as Hullett *et al.* did,[2] and cutoff values for the calculation of sensitivity and specificity of 0.13 SCFs/s (to discover moderate and severe pain).[2] It would be important to reproduce the results of Hullett *et al.* to know whether the SCFs per second may facilitate the way to monitor pain in children. Moreover, important clinical knowledge could have been discovered if 0.28 and 0.33 SCFs/s were used as cutoff values to discover severe pain, based on the findings from Choo *et al.* (fig. 3 in their article). Moreover, Choo *et al.* should also find the predicative values for no/mild and severe pain based on the cutoff values 0.13, 0.28, and 0.33 SCFs/s. These results would have been helpful to know whether the Skin Conductance Algesimeter index, SCFs per second, is useful in children postoperatively to discover no or mild pain and acute severe postoperative pain with high specificity. It would then probably be in agreement with the conclusions from the articles by Choo *et al.* and Hullett *et al.*; in addition, new important clinical information would be added from the article by Choo *et al.*

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In Reply:

We thank Dr Storm for the comments regarding our article.[1] We agree with Dr Storm that in awake patients, stressors such as nausea, vomiting, and anxiety influence the number of fluctuations in skin conductance (NFSC) and, therefore, limit the specificity of the Medstorm device as a measure of postoperative pain. These variables would inevitability be present in the clinical context of postoperative pain in children.

This is not the first study to demonstrate that the Medstorm device has poor sensitivity and specificity for pain in the postoperative period. A study of 100 adults by Ledowski *et al.*[2] indicated an optimized (by receiver operating characteristic curve analysis) NFSC cutoff of 0.1, which resulted in a sensitivity of 58% and a specificity of 61%, for a numeric pain rating score of more than 5.

We suggest that a test that is sensitive, but not specific, is not clinically useful. Therefore, a cutoff of 0.0 NFSCs would yield a sensitivity of 100% but a specificity of 0% and would clearly not be useful. We suspect that few clinicians would benefit from a device that "gives an indication on when to ask a patient about their pain" when it is relatively simple to routinely ask all patients about their pain level. We believe that the averaging interval should be a magnitude greater than the NFSC. In our clinical experience, postoperative pain does not last for only 15 s nor would it require a pharmaceutical intervention if it did occur for this short period.

The Medstorm device may have utility for detecting intraoperative pain; the variables of movement and anxiety can be appropriately controlled. However, in the complex setting of postoperative pain, the accuracy of NFSC measurements is severely compromised by numerous nonnoxious confounders of sympathetic activity.

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