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A practical calculation method for predetermination of amount and duration of expander application

Önder TAN

Abstract: Expander application has become one of the methods most commonly used in reconstructive surgery by virtue of its many advantages. Determination of the amount and duration of expansion completely depends on a surgeon's experience and clinical estimation. Interestingly, no quantitative method has been described in the literature. In an attempt to address this issue, I developed a practical calculation method for expander cases. I use this technique daily during the expansion process to decide whether or not to complete the procedure. By means of this practical method, I believe that expanders can be optimally and more effectively utilized in reconstructive surgery.

Key words: Tissue, expander

Doku genişletici uygulamasının miktar ve süresinin önceden belirlenebilmesi için pratik bir hesaplama yöntemi

Özet: Doku genişletici uygulamaları birçok avantajları nedeniyle rekonstrüktif cerrahide en sık kullanılan metotlardan biri haline gelmiştir. Genişletmenin miktar ve süresinin belirlenmesi tamamen cerrahın tecrübesine ve klinik değerlendirmeye bağlıdır. İlginçtir ki, literatürde bu konuda herhangi bir ölçülebilir yöntem tanımlanmamıştır. Bu sorunu çözmek amacıyla doku genişletici hastalarında pratik bir hesaplama yöntemi geliştirdim. Genişletme işlemi sırasında, prosedürü tamamlayıp tamamlamamaya karar vermek amacıyla tekniği günlük olarak kullanmaktayım. İnanıyorum ki, bu pratik yöntem sayesinde doku genişleticiler rekonstrüktif cerrahide optimal şekilde ve daha etkin olarak kullanılabilirler.

Anahtar sözcükler: Doku, genişletici

Since Neumann (1) first described the use of a subcutaneously placed implant for the reconstruction of external ear deformity in 1957, expander application has become one of the methods most commonly used in reconstructive surgery (2,3). Expanders present many advantages for reconstructive surgeons, including safety of application, increase in blood supply, and the elimination of sophisticated flap procedures (4,5). These devices can safely be expanded by up to 2 or 3 times their maximal volumes. At this point, determination of the amount and duration of expansion completely depends on a surgeon's experience and clinical estimation. Interestingly, no quantitative method has been described in the literature.

In an attempt to address this issue, I developed a practical calculation method for expander cases. With a compass, I first measure the projection of expanded tissue, or, in other words,

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the dimension of the area prior to expansion. I then measure the convexity of the same distance by means of a flexible paper ruler, or the dimension of the same area after expansion (Figure 1). As a third step, I subtract the former (preexpansion) value from the latter (postexpansion) one. This value represents the effective and net amount of advancement of expanded tissue. I apply this method to both the length and width of the area mentioned.

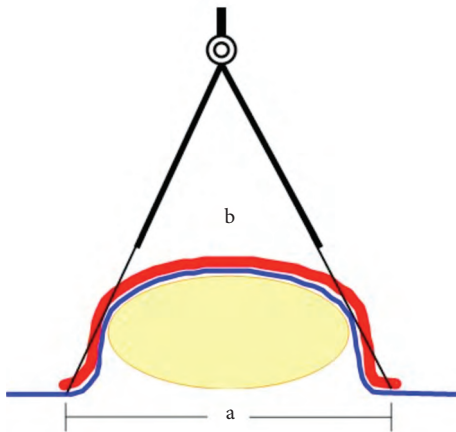


Figure 1. Projection (a) and convexity (b) of the expanded tissue are measured by a compass and flexible paper ruler (red line), respectively. The subtraction value ($b - a$) between them is the effective and net amount of advancement of expanded tissue.

After calculating the clear amounts of advancement in both the vertical and horizontal directions, I compare these values with the available defect dimensions. Thus, I objectively decide whether the area obtained following expansion is capable of closing the defect (Figures 2 and 3a-3c). If this area meets the defect site, the expansion procedure is finished. If not, I continue the procedure until the required size is reached.

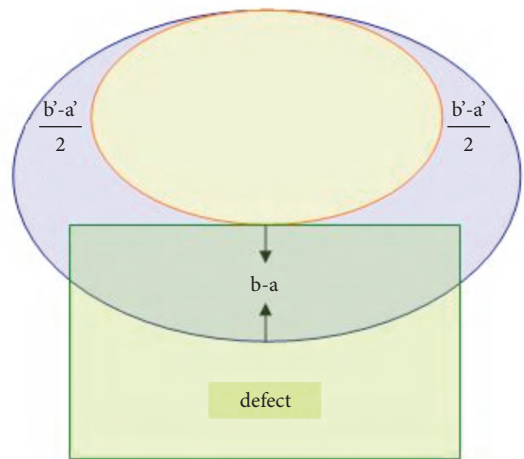


Figure 2. The method is applied to both the length and width of the expanded area. Thus, clear amounts of advancement in vertical ($b - a$) and horizontal ($b' - a'$) directions are calculated. By comparing these values to available defect dimensions, it is possible to objectively decide if the total obtained area is able to close the defect.



Figure 3. A case of nasal amputation reconstructed with the expanded forehead flap. The calculation method for predetermination of amount and duration of expander application was applied.

- a) Preoperative frontal view. The patient suffered from intentional nasal amputation with a knife. The expanded forehead flap was planned as a first choice for nasal reconstruction.
- b) Intraoperative view. The cartilage framework was achieved at the tip of nose by means of the costal cartilage. The expanded forehead flap was outlined before removing the expander.
- c) The forehead flap was transferred to the nose. The amount and duration of the expansion were sufficient for the flap to cover the nasal tip.

Predetermination of the amount and duration of expansion is essential in order to obtain successful outcomes in expander applications, because early completion results in inadequate tissue expansion and incomplete closure of the defect. Similarly, a delayed expansion procedure leaves the patient at higher risk of potential complications such as

extrusion, infection, foreign-body reaction to the expander, and loss of time, as well as higher costs. I use this technique daily during the expansion process to decide whether or not to complete the procedure. By means of this practical method, I believe that expanders can be optimally and more effectively utilized in reconstructive surgery.

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