A Different Approach in Digital Replantation Monitoring:
Pulse Oximetry

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Dear Editor,

In digital replantation, digital losses are more frequently seen within 72 hours following the surgery. Close monitoring of the replanted digit within this time frame is vital for the early detection of a possible arterial or venous occlusion, hence the decision of a recovery surgery. The surgical team's clinical observation is the most reliable method in postoperative follow-up. Hourly monitoring and assessment of turgor, capillary refill, color, and temperature are considered sufficient within the first 72 hours; however, the expectation to sustain this approach during the first 72 hours seems optimistic under the present working conditions. Therefore, an observation method in which a team of nurses is also involved and the decision to perform a recovery surgery is based on more objective data is needed.

A number of follow-up methods are defined in the literature, including those using digital thermometers, flow measurement using laser Doppler, digital subtraction angiography, fluorescein infusion, or infrared thermography. Although the use of digital thermometers is accepted as a reliable method, the instrument may be affected by ambient temperature. Furthermore, there are other methods that have been demonstrated to be superior to digital thermometers in terms of sensitivity and accuracy. Opting for technologically available solutions that provide higher reliability would be more suitable; however, availability of these solutions is typically limited by the financial and physical conditions of the hospital or clinic.

In our clinic, we use pulse oximetry for monitoring digital replantations within 72 hours after the surgery. We prefer this method because it reduces the physician's workload, delivers results based on objective values, includes a team of nurses in the process, and is easily accessible in any hospital that has an anesthesiology department. In more proximal replantations (Tamai zone II and its proximal), a newborn-type pulse oximeter loosely wrapped around the finger will be sufficient (Figure 1). Oximetry readings include saturation of peripheral oxygen (S\textsubscript{PO}\textsubscript{2}) and pulse beat per minute (PBM). The nurse monitoring the patient also measures the peak heart rate (PHR) and records these three values on a dedicated form (Figure 2). As accepted in the literature, cases when the oximeter fails to detect PBM are interpreted in favor of arterial occlusion, and cases with S\textsubscript{PO}\textsubscript{2} value lower than 90% in a patient breathing room air are interpreted in favor of venous occlusion. In our clinical evaluation, we consider a difference of 50% between PHR and PBM values to be critical, and instead of monitoring the patient until no pulse is detected, we take as reference the PBM when this value is lower than 50% of the PHR value. If the reading indicates values other than the one indicated above, the nurse informs the surgeon and a decision to perform recovery surgery may be made in line with the surgeon's evaluation.

Although using pulse oximetry in digital replantation follow-up has proven to be beneficial in our clinical experience, this method should be used as a means to warn the surgeon rather than as a means to make a recovery surgery decision. In all cases, the surgery decision should be based on the surgeon's clinical evaluation (based on capillary refill, turgor, and other indications). The pulse oximeter equipment should meet the ISO 80601-2-61-2011 standards. This indicates an error margin of ±4% at a range of 70%–100% S\textsubscript{PO}\textsubscript{2}.

\[ \text{S\textsubscript{PO}\textsubscript{2}} \]

In finger measurements, an error margin of ±1% should be added to this value. Accordingly, it would be reasonable to calculate a 5% error margin in the readings of a pulse oximeter when used on the finger in room air and to use 90% of the saturation value (95%–100% is accepted to be the normal range for a healthy individual breathing room air). Lastly, using a newborn-type pulse oximeter will allow for the visibility of the nail bed and pulp, thereby facilitating simultaneous clinical assessment.

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Although no serious complications have been encountered till date in clinical applications, pulse oximetry data can be less reliable due to misplacement of the probe in non-cooperating patients (especially in pediatric patients). The reliability of this method in all types of patients is therefore questionable.

We believe that pulse oximetry is a beneficial method and one that reduces the surgeon's workload in monitoring replanted digits when the above-emphasized aspects are observed.

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**REFERENCES**