techniques hinder comparison of results obtained by orthogonal polarization spectral *versus* side-stream dark-field imaging and may explain the differential results. Second, the authors used software to measure microvascular diameter, erythrocyte velocity, and functional capillary density. In our study, a semiquantitative analysis technique was used. Although software can be helpful in decreasing the burden of a time-consuming semiquantitative analysis, we have to look critically at the numbers produced by the software. For example, we would like to learn from the authors whether it was possible to measure erythrocyte velocity in each investigated capillary and venule. Using Microscan Analysis Software (MicroVisionMedical, Inc., Amsterdam, The Netherlands), we experienced that it was impossible to measure high erythrocyte velocities that do exist in a substantial number of capillaries. This problem is probably due to a limited video frame rate: 25 frames/s for phase alternating line standard. Finally, several issues remain unclear after reading the authors' article. The inclusion criteria used by the authors are not exactly mentioned. Did the authors investigate consecutive, low-risk patients? What was the estimated risk of surgery for the patient population (logistic European System for Cardiac Operative Risk Evaluation [EuroSCORE])? What were the incidences of postoperative morbidity and mortality? We think it might be interesting to investigate a possible relation between intraoperative hypoperfusion of the microcirculation and postoperative outcome. This might be studied in a subgroup of patients with impaired functional capillary density during cardiopulmonary bypass. In addition to this, we wonder why the authors did not separate venules from capillaries, using a cutoff of 20 μm.

To conclude, it is of interest to note that both studies reported moderate changes in the sublingual microcirculation that probably reflect a complex pathophysiology during cardiopulmonary bypass. It is expected that novel bedside imaging technology will simplify further microcirculation research in patients based on studies that were performed previously in laboratory animals.[3,4] We should focus on the questions of which individual stimuli are responsible for the reported changes and whether these changes are of clinical significance. Larger studies, perhaps in high-risk patients, would be helpful to draw stronger conclusions.

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In Reply:—We appreciate the interest of Dr. den Uil *et al.* in our article[1] and thank the authors for their comments. They refer to their publication[2] and point out some perceived differences between the studies.

Although the authors mention in their letter that our results are partly in contrast with their own findings using side-stream dark-field imaging during cardiac surgery, we suggest that both studies show rather similar alterations during cardiopulmonary bypass (CPB) for cardiac surgery. We found a transient 10% decrease of functional capillary density during CPB,[1] and den Uil *et al.* reported a reduction of microvascular perfusion index and an increased proportion of patients with impaired flow during CPB that normalizes within the first hours after surgery.[2]

The authors point out that difference in analysis routine exists: Dr. den Uil *et al.* used a semiquantitative analysis[3] to calculate the microvascular flow index, whereas we assessed the microcirculatory parameters of erythrocyte velocity, vessel diameter, and functional capillary density using Cap-image (Dr. Zeintl GmbH, Heidelberg, Germany). We do agree that automatic software to analyze routines must be well selected; however, Cap-image software is extremely well validated and has been frequently used in animal models using intravital microscopy. In the current study, all parameters were analyzed manually: diameter by drawing a vertical straight line from one vessel wall to the other, erythrocyte velocity with the use of a line-shift diagram, and functional capillary density by marking all visual perfused capillaries in a selected video sequence. Moreover, we recently found a good correlation between functional capillary density analyzed with this technique and the procedure described by De Backer *et al.*[3] giving a correlation coefficient of 0.868 (our unpublished data, May 2007 comparison study of the analysis procedures as used by De Backer *et al.* and our analysis routine). Using this Cap-image diameter and erythrocyte velocity could not be analyzed in all microvessels because in this two-dimensional optical method, not all vessels in one region of interest are in focus. It has been discussed by Lindert *et al.*[4] that using orthogonal polarization spectral imaging with a European phase alternating line (PAL) video standard, blood flow velocities can only be measured up to a maximum of approximately 1,000 μm/s, a fact that restricts its use in studies on arteriolar perfusion. In our experience, erythrocyte velocity in venules and capillaries (these are the type of vessels that can be mainly visualized with orthogonal polarization spectral imaging in sublingual tissue) is usually below 1,000 μm/s.

Regarding the patient selection and the inclusion criteria in our study, we indeed selected low-risk, elective patients and excluded any emergency or high-risk procedures. Therefore, postoperative morbidity and mortality were low; however, logistic European System of Cardiac Operative Risk Evaluation (EuroSCORE) was not assessed. We consider this reasonable to establish the normal range of microcirculatory changes during CPB in uncomplicated cases. Of course it would be most relevant to assess any possible relation between intraoperative microvascular hypoperfusion and postoperative outcome. However, it seems sensible to first characterize microcirculatory changes during uncomplicated operations. Although interesting, single case reports on patients with impaired microvascular perfusion during CPB and poor outcome do not substantially increase our knowledge regarding the role of optical methods in microcirculatory monitoring in cardiac surgery.

Finally, although De Backer *et al.* have defined a cutoff at 20 μm for the diameter of small and large microvessels, this will not enable a differentiation between venules and capillaries as suggested by Dr. den Uil *et al.*, because many smaller venules will certainly have diameters lower than 20 μm, especially taking into consideration that orthogonal polarization spectral imaging and the side-stream dark-field technique will contrast erythrocytes only, and this will underestimate vessel diameter by up to 5 μm.[5]

Further studies will have to show whether—as in septic patients—these optical methods are able to predict patients' outcome and can be influenced by therapeutic approaches.

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Chipped Rail Gear of a Lightwand Device: A Potential Complication of Tracheal Intubation

To the Editor:—A 70-yr-old woman undergoing back surgery was intubated without difficulty using the light-guided Trachlight lightwand device (Laerdal Medical, Stavanger, Norway), which we use for routine intubations in our operating room. She was then placed in a prone position, with her head held with a ProneView® Protective Helmet System (Dupaco, Oceanside, CA). A gastric tube was placed transorally. At the end of the operation, we found a white, 2-mm^3, plastic fragment on the tip of her tongue, which the anesthesiologist (K.H.) set aside and kept pending clarification of its origin. At the conclusion of the operation, the patient was extubated uneventfully and was transferred to a general ward. Nearly 1 h later, the foreign body was identified as being a chipped rail gear from the Trachlight device (fig. 1). Because the radiodensity of the fragment was approximately −80 Hounsfield units, very near that of fat (−120 units), the detection of other fragments by computed tomography scanning seemed highly unlikely, regardless of their possible location. After close observation for 7 days, the patient was discharged from the hospital without apparent complication, and has been followed for 3 months without the development of adverse health events.

The lightwand device is a useful tool for a variety of situations, such as difficult or nasal intubations, in patients with facial or cervical fractures, or for intubations in presence of bleeding in the oral cavity.[1–4] However, it has also been associated with complications, including heat trauma, and increased rates of sore throat, hoarseness, mucosal bleeding, dental trauma, and malposition of the epiglottis.[5] The Trachlight is a light and handy instrument made of plastic. Although the manufacturer disallows the reuse of the wand, it has set no time limit on the reuse of the handle. It is recommended that the device be cleaned daily with 70% isopropyl alcohol, while topical anesthetics, lubricants, or any other active ingredient applied to the endotracheal tube and wand should be used with caution. In the current case, the handle had been used in approximately 250 cases over an approximately 8-month period, never with topical anesthetics or lubricants applied to the wand or the body. Upon inspection of 10 other lightwand devices, we found one other chipped rail gear, suggesting the existence of a structural defect. Replacement of the convexity of the gear by a concave design would eliminate the risk of chipping. Having reported this incident to the manufacturer, we hope that improvements will soon be made in the production of the device.

The rail gear fragment probably broke off when the wand was withdrawn from the endotracheal tube. Because we found a single fragment and the rail was missing two teeth, the other fragment might have fallen into the trachea through the endotracheal tube. The patient being fully awake and asymptomatic when we first realized that another fragment was missing, we chose to observe her and abstained from undertaking major investigations, such as tracheal endoscopy or computed tomography.

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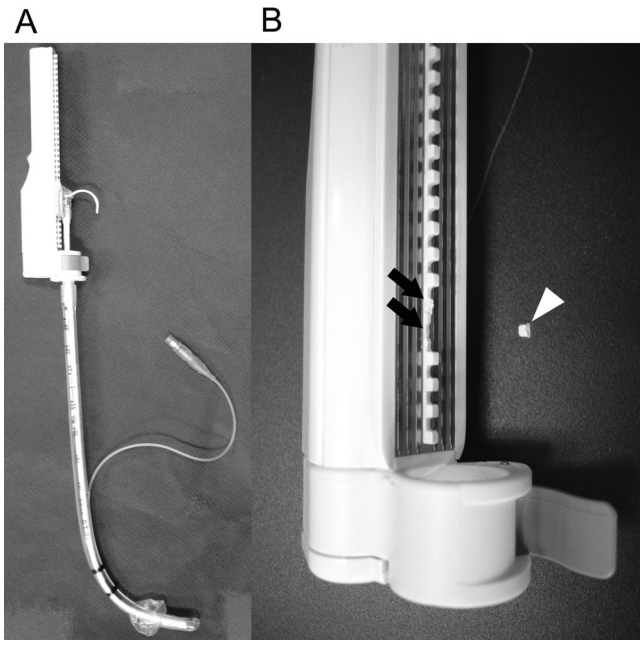

Fig. 1. (*A*) Trachlight lightwand device (Laerdal Medical, Stavanger, Norway) with endotracheal tube. (*B*) Trachlight handle and fragmented part of the handle rail gear. Two teeth are missing from the distal handle (*double black arrows*). The *arrowhead* points to the retrieved rail gear fragment.

To the best of our knowledge, this is the first report of a potential complication from a rail chipping during the manipulation of a Trachlight intubation device.

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