# CORRESPONDENCE

## Tracheotomy-Related Deaths—A Systematic Review

by Prof. Dr. med. habil. Eckart Klemm and Dr. med. Andreas Karl Nowak
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### Pathogenesis Was Only Touched on

Klemm and Nowak in their article (1) mention hemorrhage as well as fatal complications of a tracheotomy, but they hardly discuss the pathogenesis. The most severe complications include arterial or aortic hemorrhages, which develop as a result of a mostly inflammatory fistula formation with erosion of the vascular wall. In one of our own postmortem examinations, a 42 year old deceased man had developed an aortotracheal fistula starting from the lower edge of the tracheal cannula after 2 months, with acute hemorrhage into the upper airway and fatal aspiration of blood. Such a complication has been mentioned in the literature (2), and there are other reports of further iatrogenic fistula formations with fatal hemorrhage after tracheotomy (3). A rupture of the vascular wall with acute hemorrhage should be regarded as a severe to unmanageable complication that will be fatal in most cases, even though the number of such deaths can only be estimated. A postmortem examination in every case would help to determine the cause. But in Germany—by contrast to the former German Democratic Republic—no catalog exists of indications for postmortem examination that includes deaths associated with medical interventions. Such a regulation was, for example, included into the Romanian code of criminal procedure in 2014 (4). It should be checked whether options exist to avoid fistulous inflammation with rupture of the aortic wall—for example, by redesigning the lower edge of the tracheal cannula (assuming that mechanical stimulation triggers the development of an inflammatory fistula).

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### Negative Selection

The undoubtedly important review article described the ultimate complication of a common procedure in the intensive care unit, which is of relevance for different groups of medical professionals, with the particular focus on head and neck surgeons (1).

Even though Klemm and Nowak described similarly high death rates for percutaneous dilatational tracheotomy (PDT) and open surgical tracheotomy (OST), a negative selection should be assumed for the latter as it is particularly performed in patients with risk factors (e.g. coagulation disorders that cannot be corrected, severe obesity, unstable/stiffened cervical spine, struma/goiter, abnormal cervical vascular anatomy, impossibility of translaryngeal intubation, etc) in whom PDT is contraindicated (2).

For this reason, the presented morbidity/mortality rate is surprising, as a higher death rate might have been assumed for cases with an open approach (negative selection). Furthermore, differences in the technical undertaking of an OST exist. OST leaves an unsecured intubation canal and is different from OST where a circular mucocutaneous anastomosis with a stable intubation canal is performed (3).

OST is the standard technique performed by head and neck surgeons trained in otorhinolaryngology and reduces the risk of:

- Postoperative hemorrhage due to circular compression of the lateral soft tissues
- Recannulation problems because of a stable intubation canal
- Penetration of pathogens into the surrounding soft tissues.

In conclusion, as the authors pointed out, tracheotomy is certainly not a procedure which should be performed by unexperienced surgeons. The same applies to allegedly simpler operations, which should also always be carried out accordig to specialist standards (4).

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## In Reply:

Hoffmann and Greve are right to suspect selection bias regarding the indications for open surgical tracheotomy (OST) and percutaneous dilational tracheotomy (PDT). The current study did, however, not aim to weigh PDT and OST statistically against one another in terms of the question of which is the safer method (1). Both approaches come with risks and benefits, and are therefore subject to differential indications. Furthermore, no contraindication exists for OST—in contrast to PDT—in terms of being undertaken under general or local anesthesia in the operating room by an ear, nose, and throat surgeon, with all interdisciplinary safety measures in place. Whether the easier orientation of the surgically exposed area to be operated on in OST can balance out the possible problems of a puncturing procedure such as PDT in the sense of a risk reduction certainly requires further statistical studies that also consider the different techniques (2, 3) of OST. To avoid the numerous and severe changes to the tracheostoma and the cricoid cartilage after inexpertly done OST, and to avoid taking the wrong course when reinserting the cannula after a cannula loss, ENT surgeons for the longest time have demanded that an epithelialized stoma be formed as a tracheostomy, rather than a tracheotomy with an open wound canal.

We thank Lang and Dettmayer for publishing details of a typical tracheotomy-associated death as a late complication of this approach. The real number of such events can only be estimated. The fact that the results of a postmortem examination are reported in only 40 of 352 deaths was identified unequivocally as a limitation in our article. The reasons for why postmortem rates in Germany are comparatively low are well known (4). The aim is to secure funding for postmortem examinations in future by adding a quality premium for hospitals, so as to increase the currently only indirect economic/financial relevance of uncovering the correct main diagnosis and secondary diagnoses for the purposes of improving reimbursement for diagnosis related groups by the health insurers. Further advances in reducing tracheotomy-associated deaths may be possible by technically optimizing tracheal cannulas. This concerns questions of material selection as well as fluid dynamical considerations.

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**Conflict of interest statement**
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# CLINICAL SNAPSHOT

## Ulcerating Herpes Simplex Infection

A 39-year-old homosexual man in good general health and good nutritional condition complained of severe pain from medically refractory perianal ulcerations that had been troubling him for five months, causing marked sexual and emotional problems. A biopsy enabled the diagnosis of herpes simplex virus (HSV) infection, which was confirmed by polymerase chain reaction (PCR) analysis of a swabbed sample. A serologic test for syphilis was negative. Because of the unusual severity of the findings, further studies were carried out, leading to the diagnosis of an infection with the human immunodeficiency virus (HIV). Mucocutaneous HSV infections are common. Morphologically, they are characterized by clusters of vesicles, which can cause tissue erosion in their further course. An HSV infection with an atypical course should arouse the suspicion of immune compromise because of an associated illness; thus, patients with ulcerating HSV infections should also be checked for HIV. In the present case, the decision to perform a biopsy was essential for establishing the correct diagnosis.

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