

## Perforation of the proximal esophagus treated with factor XIII

A 16-year-old girl presented to us with a perforated esophagus after accidental ingestion of a toothbrush. The referring physician had already tried to retrieve the brush endoscopically without success.

Esophagogastroduodenoscopy (EGD) revealed the head of the brush impacted in the rear wall of the esophagus right under the upper esophageal sphincter. Oral retrieval of the brush was not possible so it was moved to the stomach first and then retrieved using a loop around the neck of the brush and an overtube. Inspection of the esophagus showed a near total perforation of the rear wall under the upper esophageal sphincter measuring approximately  $1.5 \times 2$  cm (● Fig. 1).

The patient was treated conservatively with antibiotics and nil by mouth. Two days after the primary intervention a second EGD was performed to inspect the perforation site. An area measuring  $1 \times 2$  cm covered with fibrin was found. This area was treated with factor XIII in all four quadrants of the lesion up to a total of 125 IU (2 ml) (● Fig. 2).

Coagulation factor XIII was first described by Laki and Lóránd in 1948 as “fibrin-stabilizing factor” [1]. Factor XIII is the last enzyme (plasma protransglutaminase) in physiological coagulation and is also important for proliferation and immigration of fibroblasts in wound healing. Factor XIII also inhibits the migration of macrophages [2]. Factor XIII has been used in the therapy of ulceration due to pressure, large burns, sepsis, and acute liver disorders [3].

On the 9th day after primary intervention only a very small lesion barely covered with fibrin without any suspicious signs was seen (● Fig. 3). The diet was increased without complications and the patient was discharged. Eight weeks after the incident EGD showed a completely healed wound at the site of the rupture (● Fig. 4).

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**Fig. 1** Site of the perforation of the rear esophageal wall directly underneath the upper esophageal sphincter.



**Fig. 3** Check-up on the ninth day after primary intervention. Slight fibrinous lesions can still be seen.



**Fig. 2** Injection of factor XIII in all four quadrants of the lesion.



**Fig. 4** Last esophagogastroduodenoscopy after eight weeks. Lesion is completely healed.

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