

Calcified subglottic scar band secondary to remote trauma: A case report and discussion of operative technique



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INTRODUCTION

Laryngotracheal stenosis (LTS) is a rare, but well-described entity. Adult LTS is generally acquired, most commonly secondary to complications from prolonged intubation or tracheotomy. Surgical management of LTS includes tracheotomy, open resection with anastomosis or open reconstruction with expansion or grafting and endoscopic procedures. Endoscopic management has gained favor as an initial treatment strategy in many patients, as the procedure is potentially less morbid. (1) We present an unusual case of calcified subglottic stenosis in which the novel implementation of an ultrasonic aspirator (UA) was employed during microdirect laryngoscopy (MDL) to remove the stenotic tissue.

CASE PRESENTATION

- A 68-year-old female with a remote history of trauma resulting in tracheostomy for 6 months and mild persistent asthma presented due to inability to intubate for elective procedure.
- In office flexible laryngoscopy revealed subglottic scar band with an anterior and posterior channel. (Fig 1a)
- Non-contrasted CT neck confirms calcified band at level of cricoid. (Fig 1b)
- PFTs showed a reduction in vital capacity, but no evidence of fixed obstruction.

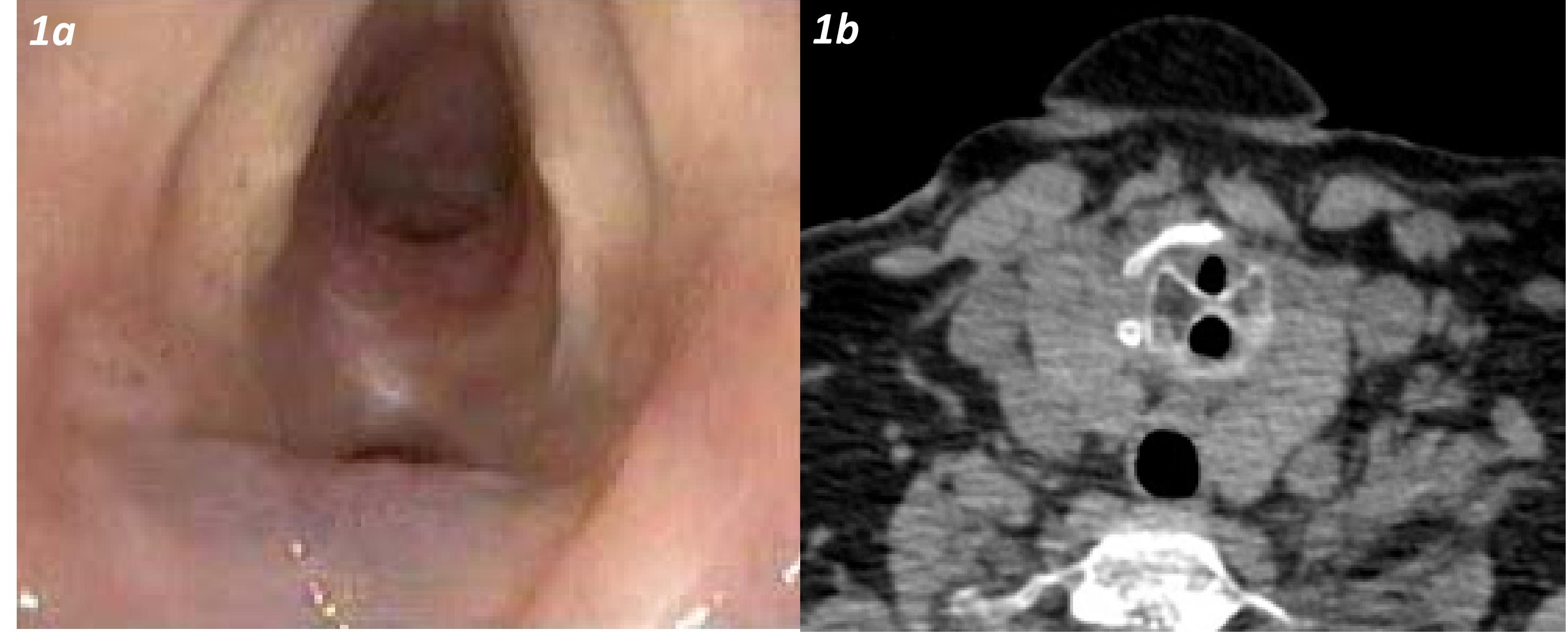
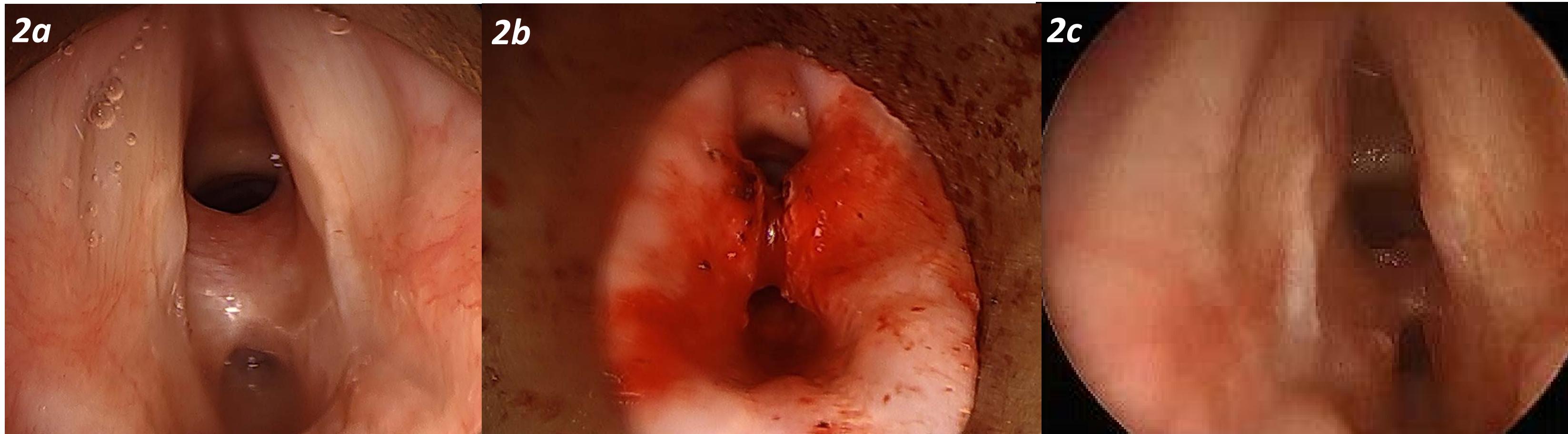


Figure 1a) Flexible laryngoscopy view of scar band 1b) Axial CT neck demonstrating transverse calcified scar band

Figure 2a) Intraoperative view of scar band 2b) Submucosal bony bridge 2c) Scar recurrence between bony ledges



Initial MDL

- Transverse scar band immediately below the true vocal folds. (Fig 2a)
- 6 mm channel anteriorly and 4 mm channel posteriorly.
- Small anterior wall stenosis 3.0 -3.7 cm below the TVC at prior tracheostomy site.
- CO₂ laser was used to make linear cuts through the scar, but unable to divide bony component. (Fig 2b)
- 1 mm Kerrison from spine set used to divide the bone.
- At follow-up, soft tissue scar reformed between bony ledges. (Fig 2c)

Subsequent MDL for staged resection of bony stenosis

- Airway management via supraglottic jet ventilation.
- A mucosal flap was elevated over the bony prominence of the stenosis.
- Using a 30-degree rod lens scope for visualization, the UA (Sonopet™, Stryker) was used to remove the bony ledge. (Fig 3a)
- Ultimately, the patient required two, serial ultrasonic aspirator interventions for the airway to be sized with a 5.0 MLT tube. (Fig 3b)
- At 6 month follow-up, endoscopy confirmed airway patency without recurrence of scarring. The patient remains asymptomatic. (Fig 3c)

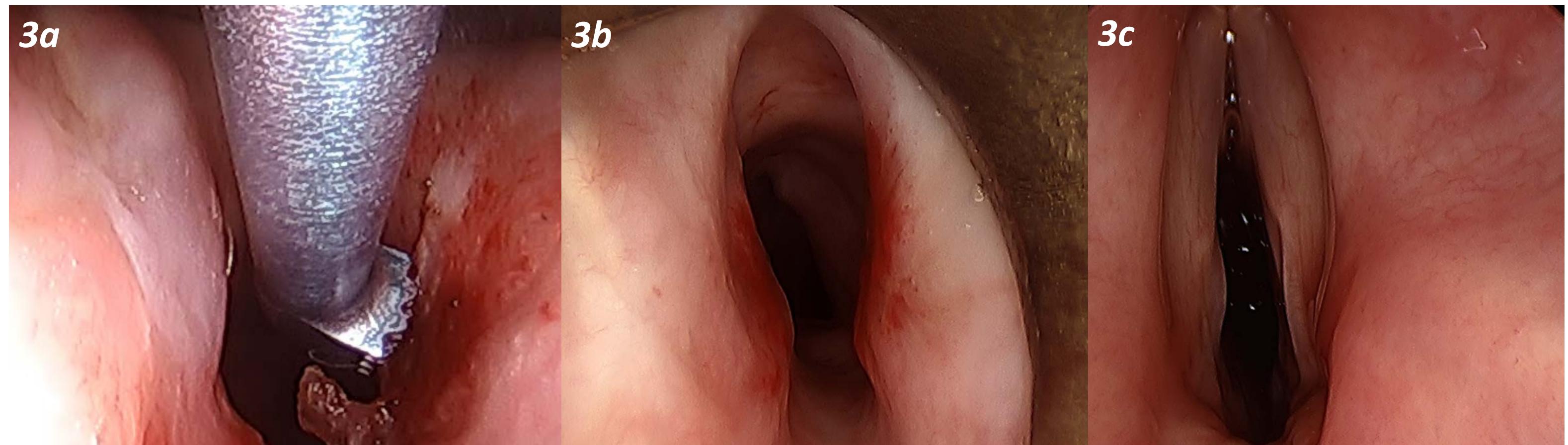


Figure 3a) Intraoperative use of UA for reduction of bony ledge 3b) MDL after first UA resection 3c) 6 month follow-up

DISCUSSION

The reported incidence of LTS after intubation ranges from less than 1% to 8.3%. (1,2)

- Mucosal capillary blood flow is compromised by an oversized or overinflated endotracheal tube.
- Mucosal edema and ulceration results in ciliary flow disruption. (1)
- Resultant stasis predisposes chronic chondritis, cartilage necrosis and, ultimately, stenosis.

Composition of stenotic tissue is variable.

- Animal models have shown temporal maturation from soft granulation tissue to mature, firm scar. (3)
- Mineralization or calcification of soft tissues after trauma has been described in the orthopedic literature. (4)
- In the case our patient, calcification of the mature scar band was likely the result of endochondral ossification driven by the intact adjacent perichondrium of the cricoid cartilage.

Endoscopic techniques for the management of LTS are well-described.

- A CO₂ laser is typically effective in this capacity due to its shallow depth of penetration and minimal nonspecific thermal affect. (3)
 - Shallow depth of penetration was a limiting factor in our case.
- UAs have been used in orthopedics and neurosurgery for its ability removal bony tissue with minimal damage to adjacent tissue. (5) Applications in skull base surgery are being explored.
- The UA takes advantage of Piezoelectric principles to convert electrical energy to mechanical oscillations of a defined frequency.
 - Ultrasonic vibrations result in tissue removal by cavitation with simultaneous removal by suction-irrigation. (6)
 - In the case of our patient, a hand piece with a unidirectional tip allowed for the gentle removal of the bony ledge without damaging the mucosal flap.
 - The hand piece was able to fit through a laryngoscopy, though an angled scope was required for adequate visualization.

CONCLUSION

Laryngotracheal stenosis is an uncommon complication of intubation that can be treated endoscopically or via open resection. Calcification of the submucosal tissue is uncommon and difficult to treat with commonly described techniques. Novel use of an ultrasonic aspirator allowed for safe removal of calcified tissue in the subglottis in this unusual case.

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