
بسم الله الرحمن الرحيم

Esophageal Stenosis due to Caustic Ingestion

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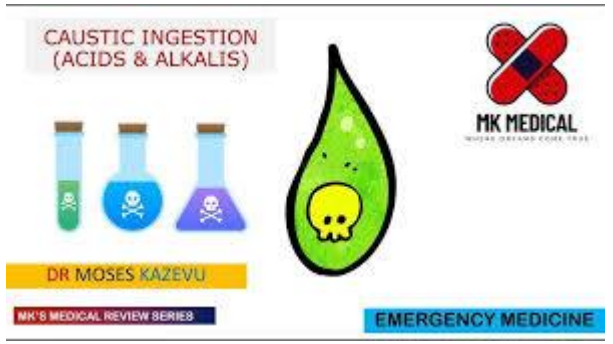
Caustic ingestion



- Caustic products ingested by children most often are strong alkaline or acidic agents.

- Liquids or foaming gels cause more serious injuries than solid products, which are more irritating and difficult to swallow

Caustic ingestion

- Strong alkali : dishwasher (sodium metasilicate, sodium tripolyphosphate), ove drain, or toilet bowl or as a declogging agent (NaOH, KOH).
  Clinitest® tablets
  Ammonia causes not only caustic esophageal injury, but also chemical pneumonitis and pulmonary edema.

- Strong acids (e.g., hydrochloric, sulfuric, formic, and phosphoric acid used in the household as cleaner for coffee makers, irons, and toilet bowls, but also used as soldering fixes, anti-rust compounds, battery liquids, and cleaners for swimming pools, milking machines, and slate).

Detergents and bleach seldom cause clinically significant esophageal injury

Clinical presentation

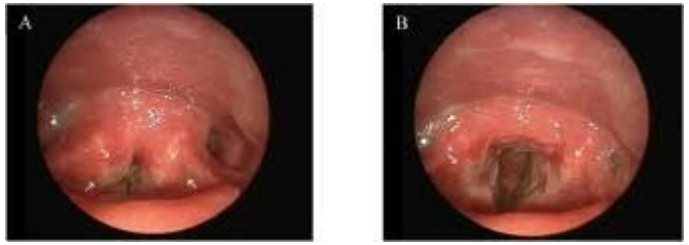
Wide spectrum:

- In many cases no complaints, normal P/E

- At the other end :circulatory shock or severe respiratory distressing following laryngeal injury occur most frequently in children

- Vomiting, dysphagia, drooling, epigastric pain, abdominal pain, and refusal to drink do not accurately predict either the presence or the severity of esophageal injury.

- Inspection of the mouth and pharynx can show edema, ulceration, or white, fragile, easily bleeding membranes over the buccal mucosa, tongue, uvula, and tonsils.



- Laryngoscopy can reveal laryngeal edema or more severe lesions.
- Fever may occur, and in 30% a leukocytosis is present.
- Serious esophageal burn and even perforation can occur in the absence of oropharyngeal burns or abdominal complaints.
- On the other hand, burns in the mouth do not provide evidence of an esophageal lesion.

- Upper endoscopy should be performed within 12–24 hours after ingestion or suspicion of ingestion.

- Esophagoscopy should be performed under general anesthesia with endotracheal intubation.

- Endoscopy should be performed after a chest X-ray including at least diaphragm cupola in order to rule out digestive perforation and pulmonary complication.

- According to pulmonary symptoms and to chest X-ray lesions, a bronchoscopy can be performed, if possible at the same time.

- Zargar’s classification
- G 0: normal examination
- G 1: edema and hyperemia of the mucosa grade
- G 2a : superficial ulceration, erosions, friability, blisters, exudates, hemorrhages, whitish membranes grade
- G 2b : grade 2a plus deep discrete or circumferential ulcerations
- G 3a: small scattered areas of multiple ulceration and areas of necrosis with brown-black or grayish discoloration grade
- G 3b: extensive necrosis Some authors include a grade
- G 4: perforation

- In extensive necrosis, grade 3b, a CT scan should be helpful to assess the deepness extension of the necrosis and to decide if an esophagectomy is indicated in emergency.

- Many, however, agree that children suspected of caustic ingestion should be admitted to the hospital for observation, at least if caustic agent is pH < 2 or > 12.

- Intravenous fluids are administered and the child not permitted to drink until the decision for endoscopy is made

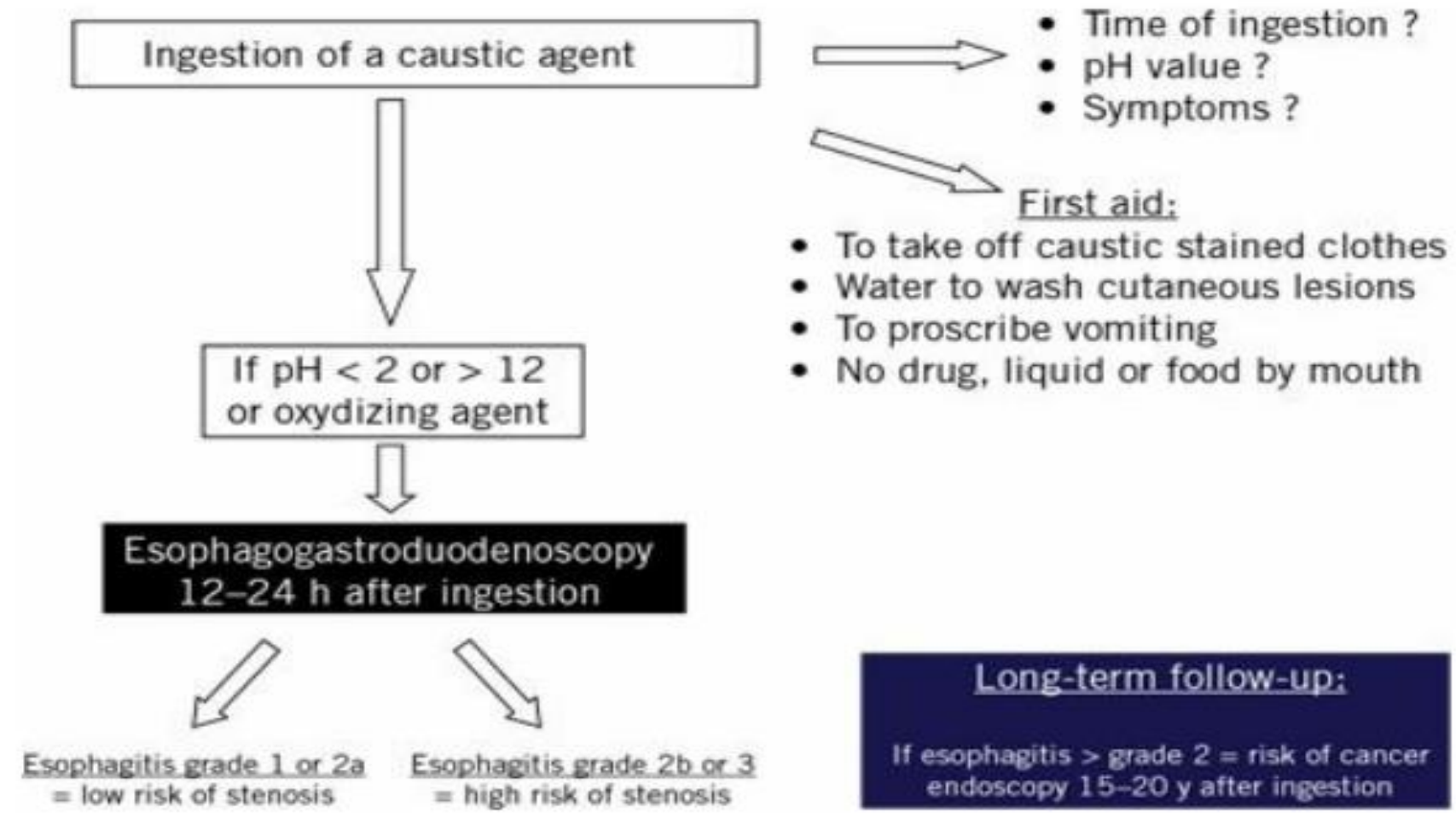


Figure 6-9 Algorithm for the management of caustic ingestions in children.

Complication

- Acute complications :

  aspiration pneumonia

  respiratory failure

  systemic complications (involving mainly liver and kidney).

- Late complications : (three weeks after the ingestion).
- main complication is esophageal stricture.

  achalasia,

  brachyesophagus,

  gastroesophageal reflux

  malignancy.

  Esophageal motor function is disordered for days to years after lye ingestion

- Most strictures result from grade 3 lesions and, to a lesser degree, from but, rarely, from grade 2a.

- Most authors agree that grade 1 lesions heal without stricture, regardless of treatment, and that grade 3 lesions progress to stricture, regardless of treatment.

- Acute inflammatory strictures appear at about 21 days (or earlier); complete stricture formation takes roughly 30–45 days

- For assess esophageal stricture, a barium swallow should be performed by the end of the first month, at least for grade 2b and 3 lesions.

- Indeed, caustic esophageal stricture are often long, tortuous, and multiple.

- After caustic ingestion, there is a 1000 -fold increase of development of an epidermoid carcinoma of the esophagus.

- American Society of Gastrointestinal Endoscopy (ASGE) follow-up endoscopy 15–20 years after caustic ingestion.

- For detect beginning lesions, acetic acid or lugol colorations should be used.

- Repeated endosopies are required every one to three years

Management

- First treatment that should be recommended is not to make the child vomit or to give any acid or alkali to neutralize the agent ingested, as is sometimes recommended on the packaging of caustic agents, since the latter can cause exothermal reactions and additional injury.

- Water can be used to wash away residual caustic from the buccal mucosa and face

- Severe symptoms are present in cases of ------- perforation, laryngeal obstruction and pulmonary edema

  ---------->I mmediate treatment consists of resuscitation, airway control

- Fuids, plasma expanders, and blood.

- Early surgical treatment ---------> in cases of esophageal or gastric perforation or laryngeal edema,
  or for feeding gastrostomy for very severe injury,

- Emergency esophagectomy ------> if ingestion of massive quantities of a strong caustic agent are ingested

- Gastric resection, if indicated, must be sparse and limited to the antrum, if possible.

Management

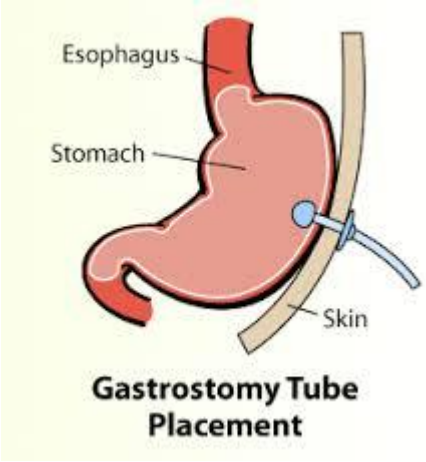
- grade 1 lesions : no treatment is indicated,

- grade 2a lesions : usually observe for 1 to 3 days in the hospital.
  In some centers, NO treatment,
  some : given oral broad-spectrum antibiotics and acid-suppression

- grade 2b or grade 3 lesion : treatment is prevention of strictures.
- Optimal nutrition is imperative during the acute healing phase.
  Liquids are given by mouth as soon as the child is able to swallow.
  start with antacids and dairy products. Then increased as
  tolerated.

- If the patient is unable to eat, --------> feeding gastrostomy or parenteral nutrition

- **TPN** is given in grade 2b and 3 lesions in some centers for at least three weeks and continued if no healing of the lesions



Gastrostomy Tube Placement

- Use of PPI ----- to prevent GERD that deteriorates esophageal burns
  and increases the risk of stricture.
  could be started intravenously then orally

- A broad-spectrum antibiotic regimen, with cephalosporin or gentamicin,
  to decrease the formation of tissue granulation
  that is involved in the development of the stricture. G2b and 3

- **Corticosteroids** : The use of corticosteroids for caustic esophageal injury controversial

- For patients with grade 2B lesions (deep focal or circumferential ulcers and no signs of esophageal perforation, ---> we suggest a brief course of high-dose corticosteroids, eg, methylprednisolone 1 g/1.73 m^2 intravenously for three days. This approach is also suggested in a European guideline [79].

uptodate

Stent

- Esophageal stent to prevent stricture formation tried in cats and human with variable degrees of success in preventing strictures

- The rationale is that stenting inhibits synechial formation in ulcerations
  inhibits excessive granuloma formation
  inhibit retraction of fibrous tissue,
  facilitates epithelialization.

A stent is believed to give a continuous, atraumatic, and early dilatation.

- Stenting was performed in the past with a silicone rubber nasogastric tube, but poor tolerance

- More recently, self-expanding plastic or metal stent inserted through endoscope with success.

- The stent can be kept in situ for three to four weeks, although durations of up to three months have been reported.

- Stenting is also used in combination with corticosteroids.

- **Possible disadvantages of stenting :**

  enhanced gastroesophageal reflux

  pro-inflammatory reactions, provoking stenosis

  delaying healing

  risk of perforation when placed in a blinded fashion

  severe ulcerative esophagitis with self-expanding metal-stent reported

Gastrostomy,

Whether or not in combination with a stent,

- performed in severe burns to allow feeding and
- to facilitate dilatations and
- allows superficial exploration of the stomach.

Esophageal dilatation

- The optimal time for beginning dilation has not been established.

- Most clinicians wait three to six weeks after the initial injury
  Some evidence that earlier dilation will increase the risk of perforation

- One study reported better results of early dilation (3- 6 wks)
  than late dilation (> six weeks)

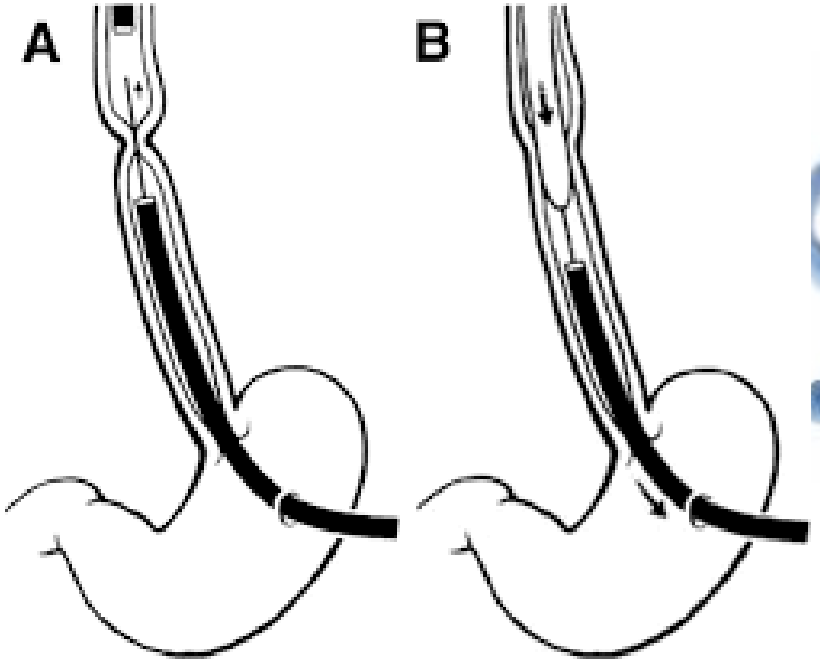
The interval between dilations varies from weekly to every 2 to 3 weeks.

- Dilatations :
- antegrade with: EderPuestow dilators

Savary bougies

mercury-filled Hurst-Maloney bougies

- retrograde : Tucker dilators using an endless guidewire via a gastrostomy.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- Every session of dilatation with the size that was used when last session was completed, or with a size close to the estimated diameter of stricture.

- When dilatation progresses, the frequency is reduced and, is eventually stopped.

- Complications : traumatic perforation and TEF

- When serious complications occur, the dilatations should be interrupted.

- Dilatation is not indicated in:

  severe extended stricture,

  patients unable to swallow their own saliva.

- Failure of dilatation is defined:

  need for continuous dilatation after completion of a 12- to 18 mo dilatation

  or severe psychological burden on the child

Endoscopic balloon dilation

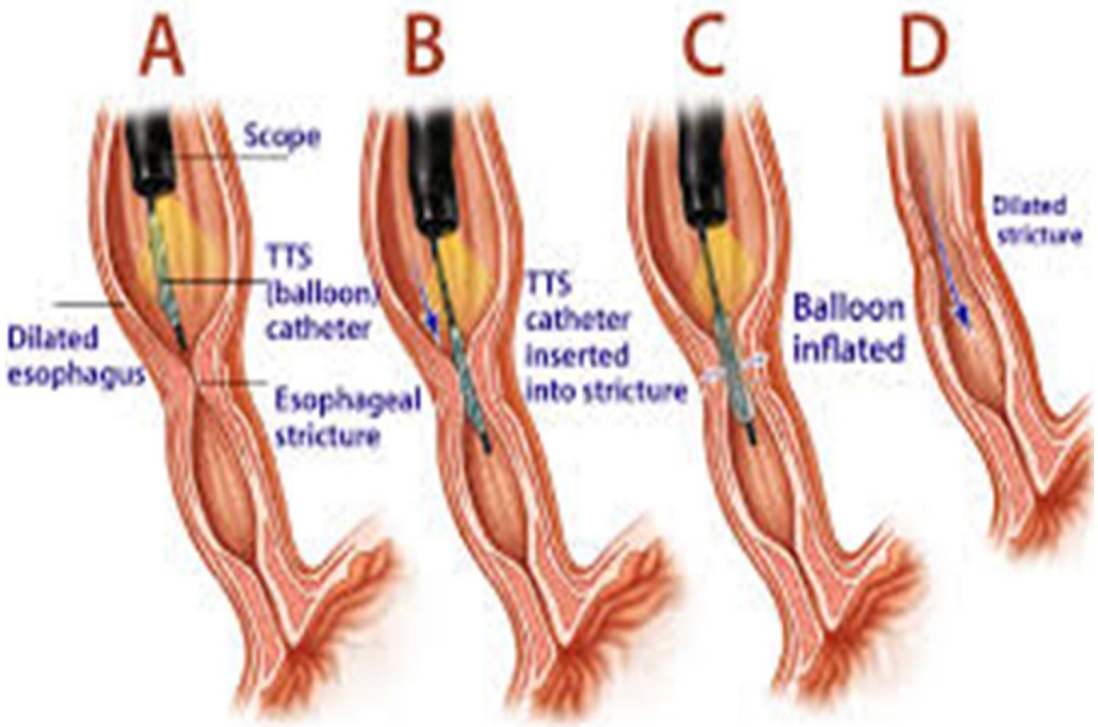
- **TTS** balloon dilators. over the wire (**OTW**)
- After visualizing the stricture, balloon can be passed through an endoscope with a 2.8-mm channel under direct vision.

- The balloon dilator is positioned through the endoscope with or without the use of a guidewire.

- The balloon is inflated with water or, occasionally, Gastrografin, held in inflation for 30 to 90 seconds, and then deflated.

- Usually two or three inflations are performed per endoscopic session, with repositioning of the balloon in between inflations.

- Balloon size can be increased for subsequent dilations in the same session, if indicated

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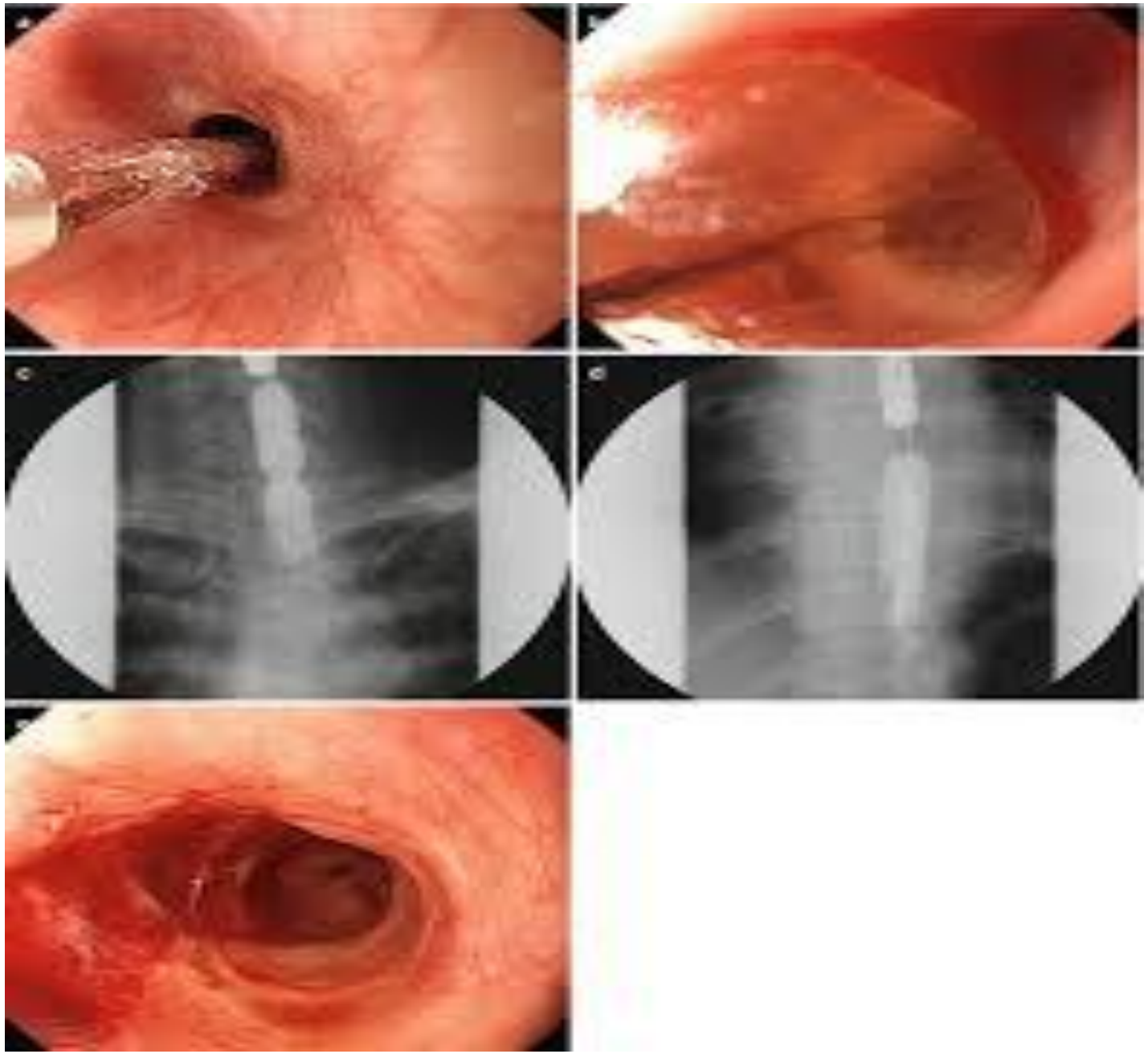


Savary-Gilliard dilators

- Hollow bougies , plastic-coated polyvinyl ranging 7 to 20 mm (21 to 60 French).
- The tip is tapered and flexible, and the shaft is more rigid.
- Endoscopy is initially performed to the level of the stenosis or beyond the stenosis, if possible.
- A flexible wire nto gastric antrum
- The lubricated bougie is then threaded over the guidewire, which is held taut
- . Serial dilations by progressively increasing the bougie size according to resistance encountered.
- The dilators should be checked for blood following each dilation.
- Several sessions rather than on a single occasion

Esophageal Dilation Procedure

Endoscope

- Esophageal dilation can also be performed by passage of progressively endoscopes.
- A gastroscope with outer diameter of 5 to 6 mm is passed initially across the stricture.
- Subsequently, gastroscopes, outer diameter of 8 to 9 mm can be passed under direct endoscopic vision using careful steady pressure.
-

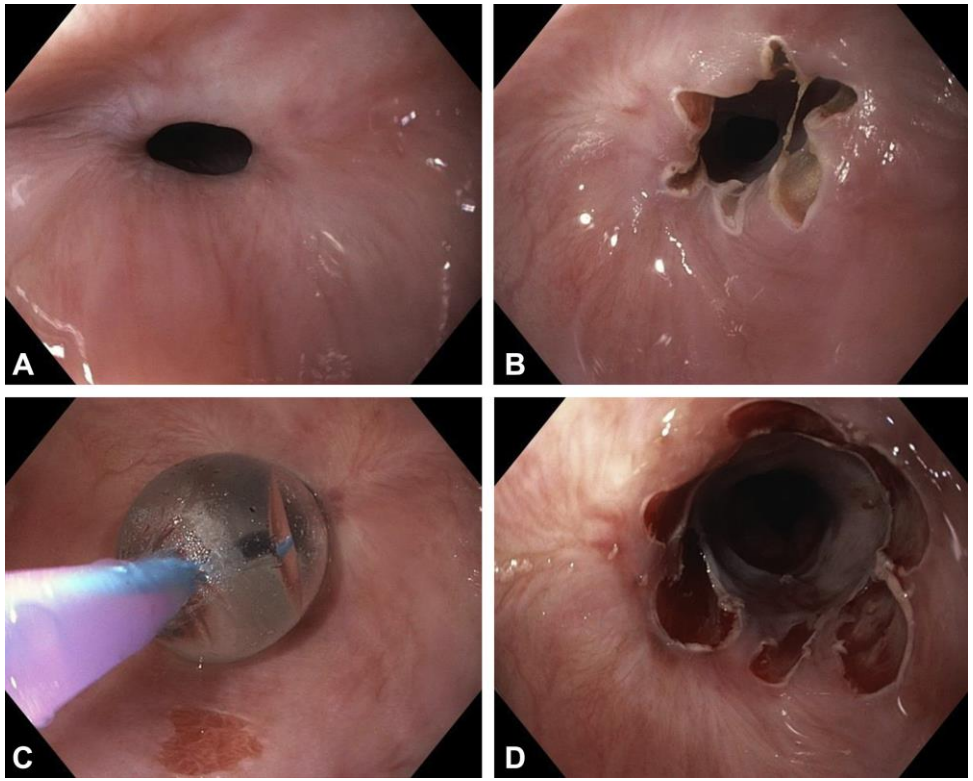
- usefulness of topical mitomycin C application to prevent the recurrence of stricture after dilatation in the management of recalcitrant esophageal strictures.

- steroid injection (triamcinolone acetanoide) for recalcitrant esophageal stricture to bougie dilation. The recurrence rate of stricture was 13% in the steroid group (triamcinolone) vs. 60% in the control group

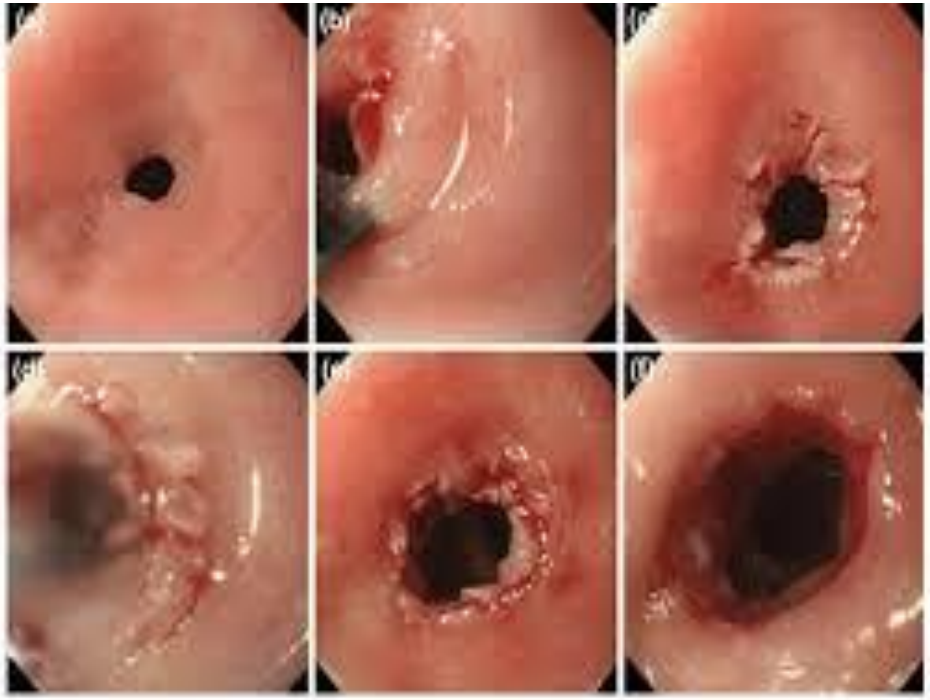
Newer therapies for benign refractory esophageal strictures include:

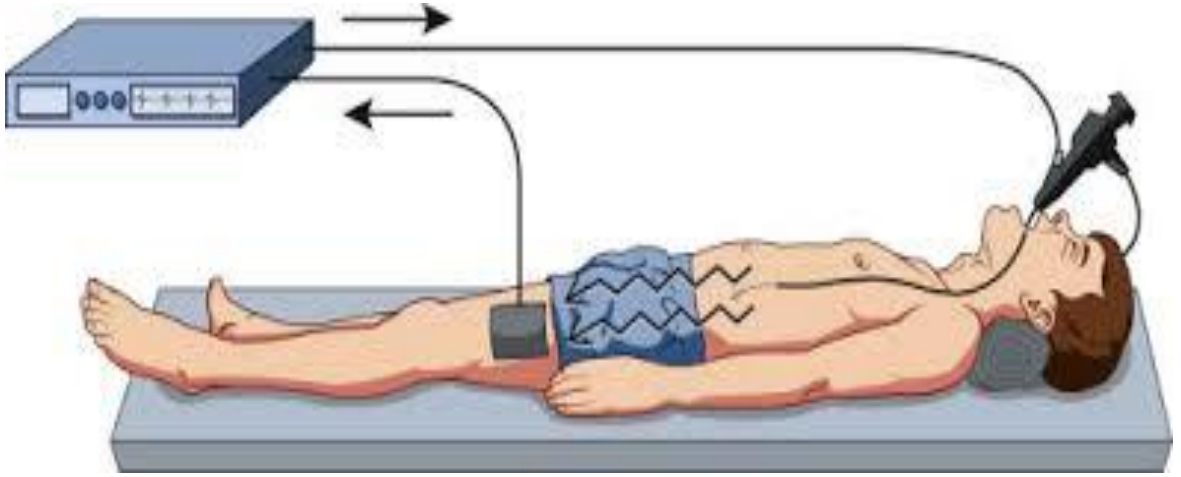
- Incisional therapy,
- Endoscopic electrocautery
- Removable stents,

Incisinoal therapy



Electrocautery





Complications

- Esophageal perforation rates at the time of endoscopy as high as 18%
- Mediastinitis,
- Pneumothorax
- Peritoneal soiling
- Brain abscess,

have been reported at the time of stricture dilation

Esophageal stent

- For refractory caustic esophageal strictures
- After surgery for congenital strictures
- Esophageal injury from batteries

- Fully covered metal (nitinol) self-expanding stents (Most data are from adults)

- Expandable uncovered metal stents for benign esophageal strictures is not recommended,

- biodegradable stents useful because of a high incidence of complications and difficulty in removal of stents. (reported in adults but not in children)

SEMS with anti-reflux valve

SEMS with anti-migration double layer and anti-reflux sleeve

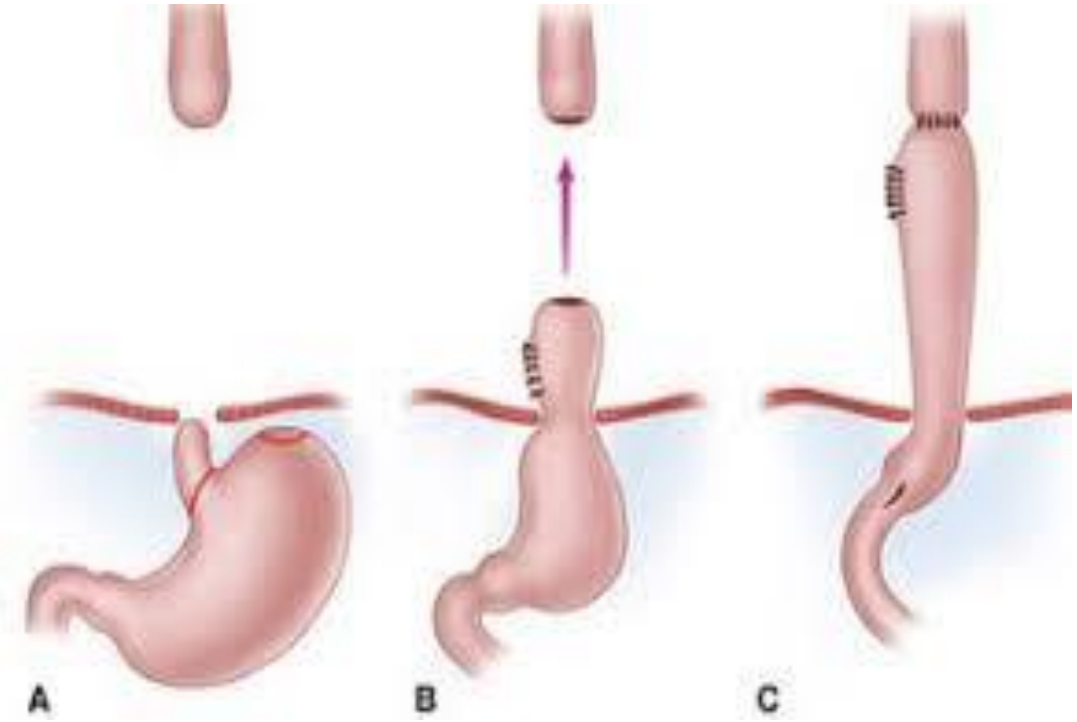
Segmented SEMS

SEMS with anti-migration double layer

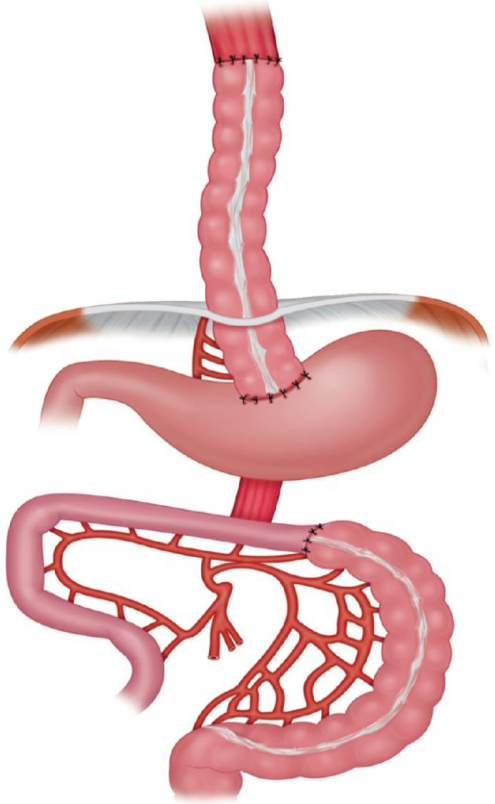
Alternative treatments

- Resection of the stenosis
- Esophageal replacement. (The most common , gastric pull-up and colon interposition)
- Esophageal replacement should not be performed before at least six months of medical treatment.
- Colonic interposition, the most frequent therapeutic procedure anti- peristaltic anastomosis is preferred. from transverse colon , left or right hemi colon .

Gastric pull - up



Colon interposition



- The native esophagus can either be left in situ and bypassed c. removed.

The preferred option for children is esophageal resection because:

- 13% incidence of esophageal cancer after bypass,
- Risk of infected esophageal mucocele in 50% of the patients after 5 years
- impossibility of endoscopic follow-up for cancer in the bypassed esophagus,

Gastric outlet obstruction

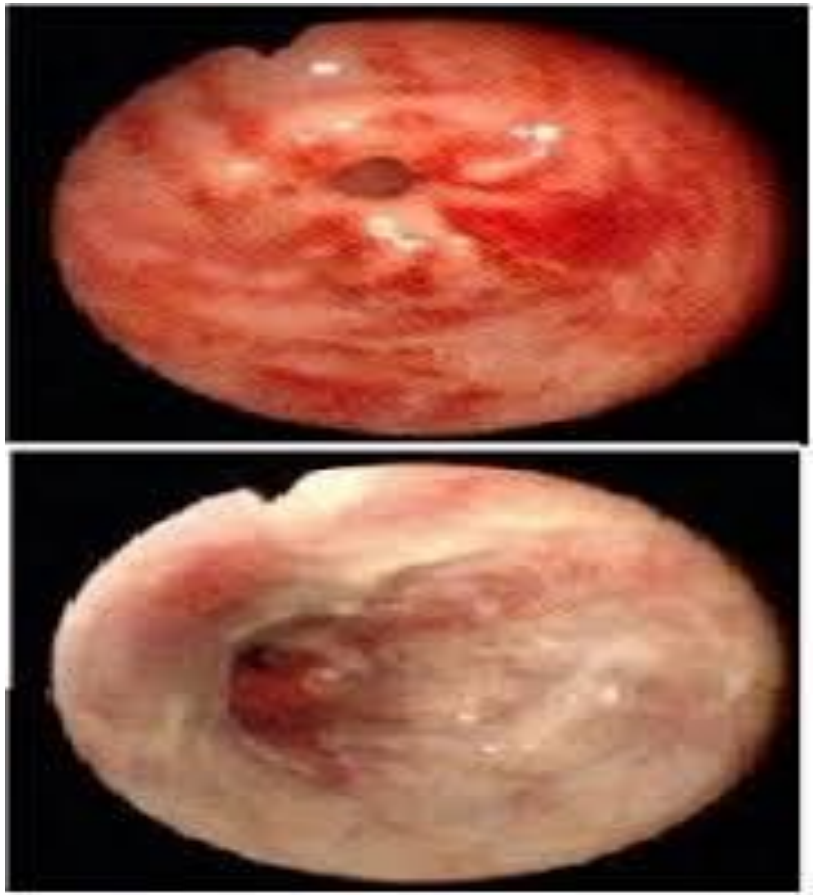
- Endoscopic gastric dilation is an alternative to surgery, with a less than 50% success.

- Pyloroplasty and fundoplication can be performed to prevent reflux

- In severe gastric adhesions and significant
- duodenal injury, gastrojejunostomy should considered

- Partial gastric resection proposed as prophylaxis against gastric malignancy.

- Regular follow-up and surveillance endoscopy is preferred.

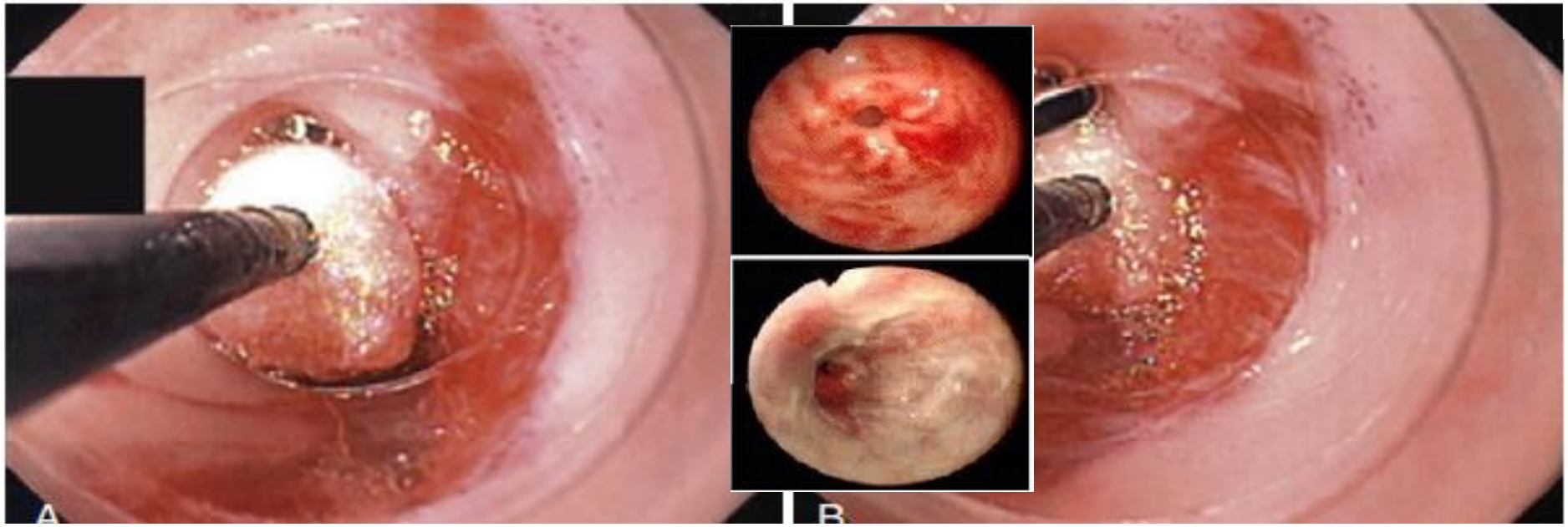


- Mitomycin C is an antineoplastic agent that disrupts base pairing of DNA molecules. This agent inhibits fibroblast proliferation and induces apoptosis at higher doses.

- Mitomycin C is usually placed topically
- however, there are reports of injection of mitomycin

- The dose ranging from 0.004 mg/mL to 1 mg/mL.

- There is a hypothetical risk of secondary malignancy with mitomycin C, which must be taken into account and discussed with the patient prior to use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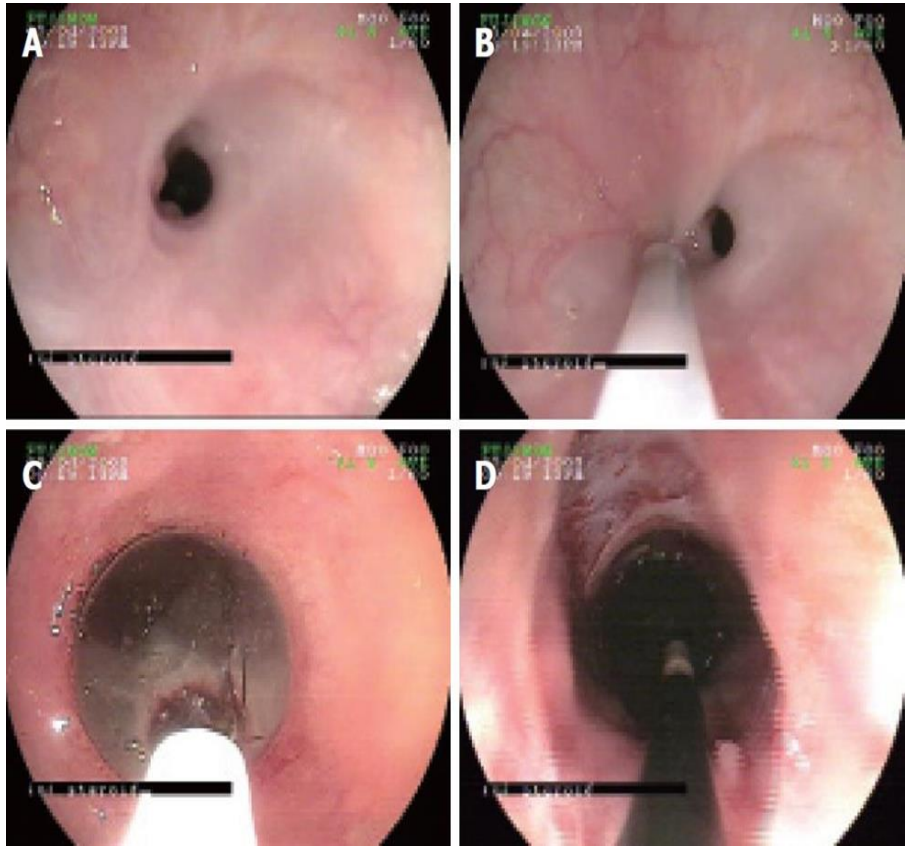
Triamcinolon acetanoid

- All patients were treated by intralesional injections of triamcinoIone acetonide (40 mg/mL diluted 1:1 with saline solution) by using a 23-gauge, 5-mm long sclerotherapy needle in aliquots of 0.5 mL. At each session, 4 injections (4 quadrants) were made at the proximal margin of the stricture with another 4 injections into the strictured segment itself whenever possible.

Gastrointest Endosc 2002 Dec;56(6):829-34. doi: 10.1067/mge.2002.129871.
Acta Gastroenterol Belg. 2020 Jul-Sep;83(3):432-440.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- complications perforation
  - torsion of the colonic transplant
  - ischemia of the colon,
  - a tracheal tear
  - pneumothorax
  - cervical hematoma.
  - anastomotic leak or fistula (The most frequent late complications)
  - cervical anastomotic stenosis,
  - anastomotic bleeding,
  - gastroesophageal reflux.
  - pyloric stenosis,
  - transient dumping syndrome,
  - eventration,
  - mediastinitis