PEDIATRIC GASTROINTESTINAL ENDOSCOPY AND BEYOND: POLYPECTOMY TECHNIQUE, RISK AND PECULIARITIES IN CHILDREN

Gian Luigi de’Angelis, Alessandro Fugazza, Barbara Bizzarri, Paola Soriani, Giorgio Nervi

Roma, 12 Aprile 2013
DEFINITION AND CLASSIFICATION

POLYP

Any macroscopic mucosal protrusion without any mention to histopathology and/or pathogenesis

According to the SHAPE

SESSILE  FLAT

PEDUNCULATED

Figure 1 Kudo classification of adenomas (Japanese Research Society for Cancer of the Colon).
According to histology...

<table>
<thead>
<tr>
<th>Type</th>
<th>Polyposis syndrome (n&gt;8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperplastic polyp</td>
<td>Hyperplastic polyposis</td>
</tr>
<tr>
<td>Tubular/Villous/Tubular-villous/close adenoma</td>
<td>FAP</td>
</tr>
<tr>
<td>Hamartomatous polyp</td>
<td>Multiple adenomas syndrome</td>
</tr>
<tr>
<td>Inflammatory polyp</td>
<td>Peutz-Jeghers Syndrom</td>
</tr>
<tr>
<td></td>
<td>Cowden’s Syndrome</td>
</tr>
<tr>
<td></td>
<td>Juvenile Polyposis</td>
</tr>
<tr>
<td></td>
<td>Inflammatory polyposis</td>
</tr>
</tbody>
</table>
DIFFERENT KINDS OF POLYPECTOMY

ENDOSCOPIC POLYPECTOMY
- Upper and lower GI endoscopy
- Double balloon enteroscopy
- Single balloon enteroscopy
- Intraoperative ileoscopy

LAPAROSCOPIC SURGERY
- Substitutive for traditional surgery
- Helpful to endoscopic polypectomy

TRADITIONAL SURGERY
- Polyp/Bowel resection
The simplest is cold forces biopsy (technique of choice for polyps between 1-3 mm); with jumbo forceps in slightly larger polyps.

1- Useful to turn the scope at 5-7 o’clock position (where the forceps exit the scope channel)

2- After closing the forceps, pull to remove

3- Examine the area to decide if further bites are necessary

**PRO:**
- No risk related to electrocautery
- Very low risk of perforation

Draganov P et al., Colonoscopic polypectomy and associated techniques. World J Gastroenterol 2010 August; 16(29): 3630-3637
POLYPECTOMY SNARE

Preferred method for larger polyps

The snare has to be chosen according to the size and position of the polyp:
- rotable snare for polyp in a difficult position
- barbed snare flat or sessile polyps
- mini snare for small polyps or to finish to remove residual tissue

Draganov P et al., Colonoscopic polypectomy and associated techniques. World J Gastroenterol 2010 August; 16(29): 3630-3637
1- The polyp should be positioned at 6 o’clock position

2- If the polyp is pedunculated, the snare should be positioned half way up to the stalk (to cut all polyp tissue, avoid perforation and to have the change to perform hemostase to the remaining stalk)

3- During hot snare the nurse should close the snare slowly and gently, to avoid to cut the polyp without electrocautery
STOP WHEN . . .

- Presence of liquid in the colon
- Contact of the polyp to the contralateral wall
- Snare too close to the colonic wall

Draganov P et al., Colonoscopic polypectomy and associated techniques. World J Gastroenterol 2010 August; 16(29): 3630-3637
After snaring and cutting the polyp, it is necessary to evaluate the adequacy of polypectomy and the absence of bleeding, and after that the polyp should be retrieved.

Even more experienced endoscopists may fail to retrieve polyp tissue up to 16% of the time.

Polyp can be retrieved:
- by suction through the scope into a trap
- with polypectomy snare
- with a foreign body roth net
- with pentapod/tripod grasping forceps

Draganov P et al., Colonoscopic polypectomy and associated techniques. World J Gastroenterol 2010 August; 16(29): 3630-3637
A DIFFICULT POLYP is any flat or raised colonic mucosal lesion that given its size, shape or location makes it difficult for the endoscopist to remove. Polyps that are > 20 mm (giant polyps >30), have a large pedicle, are flat and extended, are difficult to see or are located in the caecum or any angulated portion of the colon should be always considered difficult. Post-polypectomy complications are more common in the presence of difficult polyps.
INJECTION

Introduced by Rosenberg in 1955 and later by Deyhle in 1973 to raise flat lesions.

Injection should be made into the submucosa, into the polyp base or in the stalk:
- to create a cushion that separates the mucosa from the muscular and serosal layer to decrease the risk of perforation.
- to induce a tamponade effect on blood vessels to decrease immediate hemorrhage.

Used agents:
- Sterile 0.9% saline alone (lifting for 10-15 minutes)
- Hypertonic saline
- Plasma expander, hyaluronic acid
- Saline plus epinephrine (vasoconstrictor) and/or indigo carmine (to visualize the lifting)

Generally 3-4 ml up to 30 ml.

SALINE versus EPINEPHRINE
No statistical difference between the 2 groups.


Suck-Ho-Lee et al. Comparison of postpolypectomy bleeding between epinephrine and saline submucosal injection for large colon polyps by conventional polypectomy: a prospective randomized multicenter study. WJG 2007;13:2973-7

Randomized study on 100 polyps:
1 post-polypectomy bleeding in the injection group versus
8 bleeds in the no injection group

Infiltration with indigo carmine and diluted adrenalin; safe technique, well tolerated.
The needle:
- Not perpendicular, but oblique (to not penetrate the entire wall)
- Once the needle is introduced, it has to be gently pull back to inject the submucosa
INJECTION and LIFTING

Completely lifted-soft

Completely lifted-hard

Incompletely lifted

NOT lifted
(malignant sign)

Kato H, Endoscopy 2001; 33:568-73
CLIP'S PLACEMENT

- **Prophylactically at the polypectomy site after the removal of polyp**

- **Prophylactically at the polypectomy site before the removal of polyp to prevent bleeding**

- **In case of post-polypectomy bleeding**

**Limits**

If the snare touch the endoclip current’s diffusion!
38% of endoscopists use endoloop

Endoloop is a detachable oval shape nylon snare

It is positioned in the same way of a polypectomy snare, but more close to the gut wall and then it is tightened and released around the stalk prior to polypectomy

**Limits:**

- not easy placement
- inadequate tightening
- persistence of bleeding
- the endoloop may cut the polyp
- the endoloop may be cut by snare
**RESECTION OF POLYP**

**“PEACEMEAL” RESECTION**

To avoid recurrence, it's recommend argon-plasma coagulation ablation of the surrounding tissue.

**“EN BLOC” RESECTION**

Ideal for a better pathologic specimen.
FOR LARGER POLYPS....

CAP-ASSISTED
A suction cap may be attached to the colonoscope tip, and a preloaded snare can be placed at the mouth of the cap. Once the polyp has been aspirated into the cap, a sizable portion of the wall can be removed using coagulation current.

ESD
(Endoscopic Submucosal Dissection)

- (A) Placement of markings for the incision line.
- (B) Submucosal injections of sodium hyaluronate at the most distant margin.
- (C) Mucosal elevation with submucosal injections of sodium hyaluronate under and around the lesions.
- (D) Circumferential mucosal incision around the tumor.
- (E) Submucosal incision with a needle knife through the ST hood.
- (F) Complete resection of the tumor in one piece.

Morbidity is associated to hemorrhage and perforation. The incidence varies from 0.4% up to 4%. The incidence of mortality is less than 0.5%.


1. BLEEDING

2. PERFORATION

3. TRANSMURAL BURN SYNDROME
The most common complication (0.7% up to 24% in polyps >17 mm in adults).

More likely in:

- Polyps larger than 17 mm
- Peduncolted polyps with stalks thicker than 5 mm
- Sessile and lateral spreading polyps
- Malignant polyps

- **IMMEDIATE**: less than 12 h post-procedure

- **DELAYED**: more than 12 h post-procedure up to 30 days
IMMEDIATE HEMORRAGE

Noticed during colonscopy as bleeding from the site of polypectomy

Incidence 1.5% in adults

- Epinephrine injection at the base of polypectomy
- Endoclip placement at the base of polypectomy
- Endoloop placement to the stalk


Draganov P et al., Colonoscopic polypectomy and associated techniques. World J Gastroenterol 2010 August; 16(29): 3630-3637
IMMEDIATE HEMORRAGE
DEALYED HEMORRAGE

• Incidence 0.3%-6.1% in adults
• By now there are no possible prevention for it!
• It seems that there can be factor related to:
  1. Patient (Hypertension and anticoagulated patients)
  2. Polyp (shape, size, localization)

It can required:

✓ hospitalization with appropriate hemodynamic resuscitation
✓ blood transfusion
✓ repeating colonoscopy for definitive hemostasy (depending on location of lesion, presence of absence of active bleeding, the experience of the endoscopist, the tools at disposal)
✓ surgery

L’ APC (Argon Plasma Coagulation) is a non-contact thermal method that delivers a high-frequency electrical current to target tissue by using ionized argon plasma gas. Because of the limited depth of tissue penetration (1-3 mm) under careful settings, APC is generally regarded as a safe therapeutic endoscopic tool, despite insufficient comparative data on other established contact procedures of thermal coagulation.

Attention to the hyper-relaxation of the wall!
PERFORATION

- Incidence: 1 out of 1000-2000 colonoscopies; increased in polypectomy with
  - longer electrocautery time
  - larger polyps
  - polyps in the cecum
  - piecemeal resection polypectomy

- Much higher with ESD up to 5-10%

- Mortality 5%

- If it is visualized during colonoscopy: attempt of closure with endoclips or surgery
- Clinical aspects: abdominal pain, peritonitis, sepsis, surgical abdomen, fever, tachycardia
- Miniperforation: small perforation covered by abdominal fat with abdominal pain without sepsis

Clinical and endoscopic/surgical evaluation

- Antibiotic therapy
- Emergency TAC
- Bowel rest

Due to:
- Mechanical stress from the endoscope;
  - Barotrauma;
- Long electrocautery time;
- Depth of the polyp resection;

Gallegos-Orozco JF et al, Complex colon polypectomy Gastroenterol and Hepatol 2010; 6(6): 375-382
Transmural burn not resulting in necrosis and so perforation, is characterized by:

- leukocytosis
- fever
- abdominal pain in absence of free air on imaging

Conservative treatment: antibiotics, fluids and bowel rest
For large polyps suspicious for invasive cancer with:

Endoclip

India ink

**USUALLY NOT IN CHILDREN**

Because:

low rate of cancerized polyps.

**COMPLICATIONS:**
- Potentially side effects
  - inflammatory changes,
  - intraperitoneal spillage of ink to peritonitis,
  - abscess formation,
  - accidental marking of the small bowel,
  - fat necrosis, ….
Occasional diagnosis at 7 years old, after the onset of anemia and melena

Familiar medical history negative

Presence of pigmented macules in the peri-oral area

L.B.M., 11 years old, PJS
O.C., 10 years old, PJS
Familiar medical history negative
Diagnosis after an episode of intestinal invagination

Videocapsule: polyp in the digiunum
CLINICAL CASES: PEUTZ JEGHERS SYNDROME

ENTEROSCOPY WITH BALOON
CLINICAL CASES: PEUTZ JEGHERS SYNDROME

L.E. 14 years old, PJS

Objectivity: tense abdomen, painful with signs of peritoneal reaction, compatible with intussusception.
Lab: leukocytosis, anemia

INTRAOPERATIVE ENTEROSCOPY:

Introduction of SIF180 per os untill the «Treitz», further progression in laparoscopy with the help of the surgenon.

The last 2 meters of ileum explored appear regular; in the area of invagination ileal mucosa appears oedematous with hemorrhagic microlesions as vascular suffering; at this level there are multiple polyps (form 1 to 5 cm of size) removed using a diathermic snare, some prior infiltration of the base with diluted epinephrine (1:100,000) in voluven, methylene blue; regular the remaining small bowel segments.
D.U. 4 years old

For several months, presence of blood in stools; mild constipation.

Lower endoscopy:
Introduction of PCF 140 and progression to the terminal ileum. The mucosa of the terminal ileum and the caecum appears regular; at the right colon presence of a pedunculated polyp (of the size of about 3 cm), which is removed by diathermic snare after infiltration of the base with adrenaline diluted with saline (1:100,000) and methylene blue; subsequent clip’s placement; retrieval of polyp for histological examination; the mucosa of the transverse colon, left-colon, sigma and rectum appears regular.
CLINICAL CASES: AMPULLARY TUMOR IN FAP

A. M. C.: 45 years old

Follow-up in FAP; at the upper endoscopy (also with scope with lateral view!): irregular aspect of Vater’s papilla.

At the histology: low-grade dysplasia

Introduction of TJF145 and progression up to the II portion of the duodenum.

The Vater’s papilla presents adenomatous tissue; introduction of snare and resection of the papilla; following easy cannulation of the bile duct and E.R.C.: common bile duct not dilated; then sphincterotomy is performed. Next Wirsung incannulation and opacification with contrast was made and plastic stent was placed (7Fr, 7cm). Injection at the site of sphincterotomy of epinephrine diluted to minimum oozing with stopping the bleeding; subsequent introduction of diathermy snare and removal of residual adenomatous tissue.
CLINICAL CASES: AMPULLARY TUMOR IN FAP
Different kinds of polypectomy techniques, applied in adults, can be also used in children.

The endoscopic training on children is more difficult than adult patients, because of the less number of procedures.

Endoscopic polypectomy, especially in case of «difficult polyps» or in patients with polyposys syndromes, should be done only in specialized centers, with a high flux of young patients.

Don’t forget adult patients, with old diagnosis.
Thanks for your attention!
High Cumulative Risk of Intussusception in Patients With Peutz–Jeghers Syndrome: Time to Update Surveillance Guidelines?

M.G.F. van Lier, MD¹, E.M.H. Mathus-Vliegen, MD, PhD², A. Wagner, MD, PhD³, M.E. van Leerdam, MD, PhD¹ and E.J. Kuipers, MD, PhD¹, ⁴

OBJECTIVES: Peutz–Jeghers syndrome (PJS) is characterized by gastrointestinal hamartomas. The hamartomas are located predominantly in the small intestine and may cause intussusceptions. We aimed to assess the characteristics, risk, and onset of intussusception in a large cohort of PJS patients to determine whether enteroscopy with polypectomy should be incorporated into surveillance recommendations.

METHODS: All PJS patients from two academic hospitals were included in this cohort study (prospective follow-up between 1995 and July 2009). We obtained clinical data by interview and chart review. Deceased family members with PJS were included retrospectively. Cumulative intussusception risks were calculated by Kaplan–Meier analysis.

RESULTS: We included 110 PJS patients (46% males) from 50 families. In all, 76 patients (69%) experienced at least one intussusception (range 1–6), at a median age of 16 (3–50) years at first occurrence. The intussusception risk was 50% at the age of 20 years (95% confidence interval 17–23 years) and the risk was independent of sex, family history, and mutation status. The intussusceptions occurred in the small intestine in 95% of events, and 80% of all intussusceptions (n=128) presented as an acute abdomen. Therapy was surgical in 92.5% of events. Based on 37 histology reports, the intussusceptions were caused by polyps with a median size of 35 mm (range 15–60 mm).

CONCLUSIONS: PJS patients carry a high cumulative intussusception risk at young age. Intussusceptions are generally caused by polyps >15 mm and treatment is mostly surgical. These results support the approach of enteroscopic surveillance, with removal of small-intestinal polyps >10–15 mm to prevent intussusceptions. The effect of such an approach on the incidence of intussusception remains to be established in prospective trials.

*Am J Gastroenterol* 2011; 106:940–945; doi:10.1038/ajg.2010.473; published online 14 December 2010