Large sessile colonic adenomas: use of argon plasma coagulator to supplement piecemeal snare polypectomy

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Background: **Residual adenoma is frequently found at the site of endoscopically resected large sessile adenomas on follow-up examination. We evaluated the efficacy of a thermal energy source, the argon plasma coagulator, to destroy visible residual adenoma after piecemeal resection of sessile polyps.**

Methods: **Seventy-seven piecemeal polypectomies with or without the use of argon plasma coagulator were analyzed retrospectively. All polyps were sessile, 20 mm or greater in size. The results from three groups of patients were compared. The study group was composed of patients who had visible residual adenoma after piecemeal polypectomy and had the base of the polypectomy site treated with the argon plasma coagulator. The first comparison group consisted of patients who underwent standard piecemeal polypectomy in whom the colonoscopist thought that all adenomatous tissue was removed and no further treatment was necessary. The second comparison group included patients in whom visible residual adenoma was left at the base after piecemeal resection of large adenomas. Follow-up colonoscopy was performed approximately 6 months after the initial procedure to check for recurrent/residual adenomatous tissue.**

Results: **The argon plasma coagulator was used after 30 piecemeal polypectomies in an attempt to eradicate visible residual adenomatous tissue; at follow-up, 50% of these cases had complete eradication of adenoma. The group in whom all visible tumor was removed by piecemeal polypectomy alone had an adenoma eradication rate of 54% on follow-up colonoscopy. In the patients in whom visible residual adenoma was left at the site the recurrence rate was 100% on the follow-up examination. Bleeding necessitating endoscopic therapy occurred once (3.3%) in the argon plasma coagulator group; there were four (12.5%) bleeding episodes and one (3.1%) confined retroperitoneal perforation in the complete piecemeal polypectomy group and no complications in the group in which polypectomy was incomplete.**

Conclusions: **Argon plasma coagulator ablation of residual adenomatous tissue at the polypectomy base is safe and useful. It helps to complete the eradication of large sessile polyps when there is visible evidence of residual polyp. (Gastrointest Endosc 1999;49:731-5.)**

Adenoma remnants are frequently present after piecemeal resection of large colon adenomas.[1-7] We hypothesized that the application of thermal energy to any residual adenomatous tissue would decrease the in situ recurrence rate after piecemeal resection of large adenomas. We evaluated the argon plasma coagulator (APC) (ERBE ICC 350; ERBE Electromedizin, Tübingen, Germany) for this purpose because depth of tissue injury is limited with this device and direct tissue contact is not required.

Received August 6, 1997. For revision September 1, 1998. Accepted February 10, 1999.

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0016-5107/99/$8.00 + 0 **37/1/97779**

PATIENTS AND METHODS

Over a period of 2 years outcomes of all polypectomies of large colorectal adenomas performed with or without the assistance of the APC were collected, with all data recorded for each patient immediately after polypectomy. The results were analyzed retrospectively. The electrosurgical unit employed was a Valleylab surgistat (Boulder Colo.), using pure coagulation current at a dial setting of 3. All snares used were manufactured by Wilson-Cook, Inc. (Winston-Salem, N.C.). Because of our experience of a high recurrence rate when large colorectal adenomas were

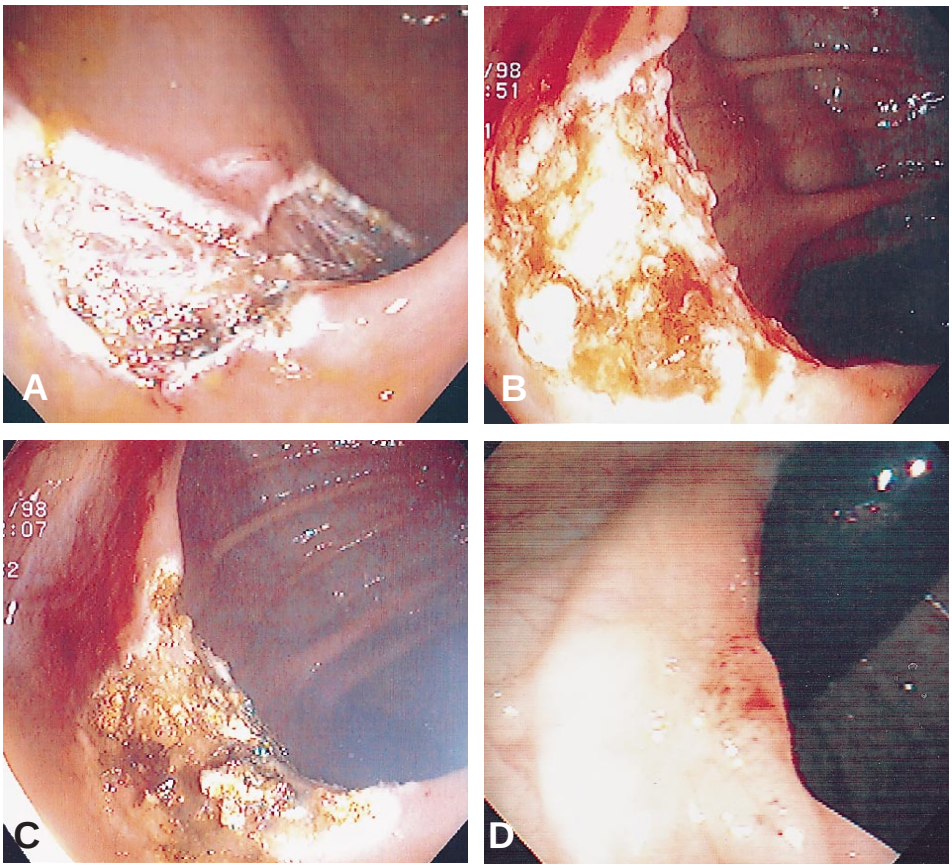

Figure 1. Colonoscopic images. **A,** Clean polypectomy site with no visible residual adenoma. **B,** Polypectomy site with visible residual adenoma. **C,** Same patient as **(B)** after treatment with APC. **D,** Recurrent adenoma at polypectomy site on follow-up colonoscopy.

removed in piecemeal fashion, we included only sessile polyps 20 mm or greater in size that required piecemeal polypectomy with or without the submucosal injection of saline. Pedunculated polyps as well as those containing invasive carcinoma were excluded from analysis. All of the patients were referred by gastroenterologists who thought that endoscopic removal of the polyps was difficult (due to size or location) and that special expertise was required. All colonoscopies were performed by a single experienced endoscopist (J.D.W.) in a private office setting. Only patients who had follow-up colonoscopy by J.D.W. were included in the analysis; those who had follow-up colonoscopy performed elsewhere were excluded.

Three patient groups were analyzed and compared. The study group was comprised of patients who had grossly visible residual adenomatous tissue at the polypectomy site and in whom the APC was used to treat the polyp base in an attempt to destroy all of the residual polyp. The first comparison group consisted of patients who had complete polypectomy performed using a piecemeal technique with or without submucosal saline injection with all visible polypoid tissue removed at the initial polypectomy session and no further treatment given. The second comparison group was comprised of patients who had visible residual adenomatous tissue at the site of piecemeal polypectomy, with no thermal modality used to treat the site. This group was identified by reviewing videotapes of all polypectomies involving large sessile polyps during a 2-year period before the availability of the APC. In all of these cases the amount of residual adenomatous tissue was relatively small with completion of the polypectomy being planned for the next session once the site had healed.

The polypectomy site in some of the patients in each group was injected with india ink to facilitate localization in the future. Follow-up colonoscopy was performed in all patients approximately 6 months later to check for completeness of polypectomy. Recurrence or residual polyp was defined as the presence of any amount of adenomatous tissue on follow-up, even as small as 1 mm, confirmed by histology at the site of prior snare polypectomy.

Seventy-seven polypectomies in 72 patients were evaluated; 30 polyps had visible residual adenoma and were treated with APC, 37 had a clean polypectomy site (first comparison group), and 10 had visible residual adenoma but were not treated with any thermal modality (second comparison group) (Fig. 1). The average age of patients was 70 years for the APC group and 67 years for the second and 66 years for third groups. There were no differences in age or gender or in the prevalence of comorbid illness among these three groups. All colonoscopies were performed on an ambulatory basis.

Table 1.
Outcomes of polypectomy of large colorectal adenomas performed with APC-assisted versus standard technique

Piecemeal polypectomy	APC group	Comparison group without visible residual polyp	Comparison group with visible residual polyp
No. of patients	30	32	10
No. of polyps	30	37	10
Average polyp size (mm)	32.2	28.4	30.0
Months to follow-up colonoscopy	5.5	7.1	6
Recurrence at follow-up	15 (50%) (1)	17 (46%)*	10 (100%) (2)
Complications (perforation)	0	1 (3.1%)†	0
Complications (bleeding)	1 (3.3%)	4 (12.5%)†	0

Difference between (1) and (2), $p = 0.271$ (not significant).
*Percentage of total number of polyps.
†Percentage of total number of patients.

The APC is a device that allows electrical energy to flow through and ionize argon gas (the argon plasma). When the tip of the electrode is close to tissue in contact with a return electrode (patient plate), a spark is discharged through the ionized plasma, resulting in thermal damage to the target tissue. If electrical energy is not discharged by arcing to nearby tissue there is no ignition, and activation of the foot switch merely results in insufflation of inert argon gas. The depth of tissue injury is directly dependent on two variables: the energy output of the generator, and the time of current application. At the low setting of 40 W, the zone of coagulation necrosis is approximately 1.5 mm deep with a 5 second application. Shorter duration of thermal energy application with more superficial coagulation is achieved by moving the tip continuously as the thermal energy is applied. The gas flow is 0.8 L/min. During activation an attempt is made to avoid touching the colon wall with the flexible probe tip, but because of the low energy output used in the colon, the spark gap is only 1 to 2 mm, and occasional tissue contact is unavoidable. With inadvertent tissue contact, there was no adverse outcome but occasionally the submucosa became alarmingly inflated as argon gas flows into that tissue space via the mucosa burned by the coagulator. When used to destroy residual polyp tissue, the spark was applied to the edges of the polypectomy site and to any visible residual polyp.

RESULTS

Outcomes for the three study groups are summarized in Table 1.

Postpolypectomy bleeding necessitating endoscopic therapy occurred once (3.3%) in the APC group; there were four (12.5%) bleeding episodes and one (3.1%) confined retroperitoneal perforation in the first comparative group and no complications in the second comparative group. None of the patients who bled was taking coumarin or had known coagulopathy at the time of the procedure. Bleeding was treated endoscopically in all cases; two patients in the comparative group required two blood transfusions each. The perforation was successfully treated without surgery. Histopathologic assessment revealed 27 (90%) tubulovillous adenomas and three (10%) tubular adenomas in the APC group compared to 31 (83.8%) tubulovillous adenomas and six (16.2%) tubular adenomas in the first comparative group and eight (80%) tubulovillous adenomas and two (20%) tubular adenomas in the second comparative group. High-grade dysplasia was present in five (16.6%) polyps in the APC group and two polyps (5.4%) and one (10%) polyp in the first and second comparative groups, respectively. The distribution of polyps is summarized in Table 2. In all groups, adenoma recurrence on follow-up was usually relatively small in relation to the initial size of the polyp. The size of the residual polyp ranged from a few millimeters up to 50% of the size of the original polyp. In all instances the remaining adenoma was amenable to total resection on the second examination.

Frequencies of recurrence and complications were analyzed by Fisher's exact test. A probability level of $p < 0.05$ was considered significant.

DISCUSSION

Piecemeal polypectomy of large sessile colorectal adenomas has a rate of recurrent/residual polyp at the polypectomy site that ranges from 16% to 46% in different series.[1-6] Recurrences are often found after a "clean colon" status was obtained, which often required more than one colonoscopy.

There is a paucity of reports on eradication of residual adenomatous tissue after piecemeal polypectomy to prevent recurrences.[7] There are none on the use of monopolar electrocautery, multipolar probe, or the APC. One randomized prospective trial comparing Nd:YAG laser therapy after snare debulking with injection-assisted piecemeal polypectomy of sessile rectal adenomas larger than 4 cm found that com-

Table 2.
Distribution of large sessile colorectal polyps in three groups

Location	APC group	Comparison group without visible residual polyp	Comparison group with visible residual polyp
Rectum	7	4	2
Sigmoid colon	1	2	1
Descending colon	0	2	0
Splenic flexure	0	1	0
Transverse colon	4	2	1
Hepatic flexure	2	3	1
Ascending colon	7	15	3
Cecum	9	8	2
Total	30	37	10

plete ablation was achieved in 63.6% with laser versus 33.3% with piecemeal snaring.[8] In one uncontrolled trial of laser photoablation of large sessile adenomas after snare piecemeal polypectomy, the rate of successful eradication after single session was 48% and 89% after an average of 2.1 sessions.[9] One interesting technique called incision-injection–assisted snare polypectomy was recently reported: A large volume of saline was injected under the polyp and then circumferential needle-knife incisions were made within the saline mound but outside the circumference of the polyp.[10] This allowed the polypectomy snare to be seated into the cautery ridge around the polyp. The recurrence rate was reported as zero (33 polypectomies), but there was no control group and it took approximately 1 hour to remove an average-sized polyp (40 mm) in the right colon.

In our experience, when residual adenoma was left at the polypectomy site after piecemeal polypectomy there was a 100% incidence of recurrent adenoma at the follow-up examination at 6 months. We found that when all visible adenoma is removed during piecemeal polypectomy of large sessile adenomas and no additional thermal modality is used to treat the polyp base, recurrent adenoma is present in 46% of cases. The additional use of the APC to destroy visible residual tumor has resulted in a recurrence rate of 50%, which is the same as expected when all visible tumor has been removed and half the actual rate of recurrence when visible adenoma has been left at the base without further treatment. Although all patients who had residual adenoma at the polypectomy site had residual adenoma on follow-up, the small sample size was not amenable to statistical analysis.

APC is a new endoscopic technique for thermal coagulation. This modality applies high-frequency electrical current to the target tissue through ionized, electrically conductive argon gas. APC is considered to be a noncontact modality that avoids adhesion between electrode and coagulum. Tissue is not vaporized during APC and the depth of coagulation is partially limited by a thin, electrically insulating superficial layer of desiccated tissue, but prolonged coagulation will result in a greater depth of tissue penetration. At full power (100 W and 20 seconds' application time) the maximum coagulation depth attainable with this modality is approximately 5 to 6 mm.[11] The ability to limit the level of thermal penetration is advantageous when APC is applied to the large bowel.

The APC has been found to be especially useful for hemostasis of bleeding from the surface of parenchymal organs and for the destruction of defined pathologic tissue layers.[12-18] Since 1991, with the development of thin catheters that can be passed through the accessory channel of flexible endoscopes, APC has been used in therapeutic endoscopy.[19] Endoscopic use of APC has been reported in the treatment of bleeding peptic ulcers, angiodysplasia, gastrointestinal malignancies, Barrett's esophagus, radiation proctitis, Zenker's diverticulum, and colonic polyps.[20-34] However, there are no controlled trials, and published data regarding its safety are scarce.

In our study all patients in the group in which APC was used had grossly visible residual adenomatous tissue at the polypectomy site and therefore, the expected recurrence rate in these patients would be 100% if no further ablation technique were used. One important question arises from this study: Because there is a 46% recurrence rate after initial piecemeal polypectomy, even if the site appears "clean," would APC at the polypectomy site of large sessile polyps decrease the recurrence rate and potentially permit prolongation of surveillance interval?

In summary, low-energy APC appears to be safe and a useful adjunct to piecemeal polypectomy of large colonic adenomas. More controlled clinical investigations are necessary to further define the effectiveness of this new and interesting technique.

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