High Intensity-Low Duration "Hot Biopsy" Forceps Coagulation: A Safe Method

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Citation

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Abstract

Objectives: To test the rate of complications of hot biopsy forceps polypectomy performed according to our usual method in a descriptive, prospective, open study.

Methods: During 12 consecutive months every patient addressed for colonoscopy was included. Every polyp seen was destroyed by hot biopsy coagulation, if possible, according to the criteria below. If not, it was snared. Coagulation, after conventional tenting, used the minimum number of short impulses (less than 1 s) of high-intensity, pure coagulation current (setting 4 corresponding to 40 w), designed to limit the depth of the burn, according to the complex physical properties of high frequency currents. Selected large, benign-looking polyps up to 15 mm were destroyed by hot biopsy, if the neck after tenting was 5 mm large or less.

Results: Among 1,228 colonoscopies, we destroyed 888 polyps in 451 patients, 727 by hot biopsy forceps, including 210 in the caecum, ascending colon and hepatic flexure and 23 over 10 mm. The complications were: one minor delayed bleeding and one benign post-polypectomy syndrome. No serious complication was encountered. No complication occurred after hot biopsy of 69 polyps among the 41 patients aged 80 and over.

Conclusions: With the present technique, hot biopsy forceps coagulation is safe, even in the right colon and among selected, relatively large polyps up to 15 mm.

INTRODUCTION

Hot biopsy forceps (HBF) polypectomy (HBFP) is frequently blamed for frequent complications, perforation and hemorrhage, especially when performed on right-sided polyps ([1,2,3,4,5,6,7,8,9]). These complications are ascribed to the width and depth of the electric burn ([2, 5, 6]).

Our daily practice for the past 20 years has shown that HBF coagulation was efficient and safe with our technique, derived from a long experience of electro-coagulation of rectal cancers and villous tumors through conventional proctoscopes ([10]). The main problem, in our opinion, lies in the fact that a low-intensity, long-duration coagulation produces a deeper burn than a high-intensity, short-duration one ([10,11,12,13]). Therefore, we have performed a one-year descriptive study of our daily polypectomy practice to contribute to the evaluation of HBFP safety, when performed according to the above principle.

AIM OF THE STUDY

To ascertain the safety of the present technique of HBFP among a non selected, primary referral population during a non-randomized, prospective, descriptive study.

SETTING, PATIENTS AND METHODS

SETTING: Primary referral gastroenterology practice of two endoscopists working together for 13 years with similar methods, based in a medium-sized, French city.

PATIENTS: During 12 consecutive months, every patient referred for colonoscopy, whatever it's indication, was included without selection. As the study was purely descriptive and because technique of polypectomy did not differ of our day-to-day practice, patients were simply informed, as usual, of the risks of colonoscopy and polypectomy. For office-based colonoscopy, no patient was rejected for age or bad general condition, if indicated otherwise.

METHODS: The preparation was conventional with 4 l PEG solution. An advice paper was delivered and explained when making the appointment. After completion of colonoscopy, a second paper was given and explained, reminding to call the endoscopist, in case of any incident. The referring GPs and the surgeons of the county were asked to report any complication. The patients were seen for follow-up between 1 and 5 years later, according to the characteristics of the polyps destroyed.

Crossing these 4 sources of information avoids a possible underrating of clinically significant complications. Any polyp seen was destroyed, except if obviously useless, like near a cancer. At that time, we did not use cold biopsy forceps polypectomy to treat diminutive polyps. All fluid was sucked off before polypectomy to avoid current's escape ([11]). Polypectomy used either HBF or diathermic snares, always with a partial colonic deflation.

In case of HBF coagulation, the top of the polyp was grasped and pulled, leading to a “tent”. The coagulation used pure coagulation current. The dial calibrations on electro-surgical units are typically arbitrary and differ widely one of the other ([11]). Therefore, it is important to be accustomed to the device used to define precisely the optimal setting. We used setting 4 on standard ValleylabR coagulator, corresponding roughly to 40 w ([11]), because the relationship between setting and power is not linear, owing to the complex physical properties of high-frequency currents ([11]). On digital devices we set the power display at 40 w. The setting may be higher, according to the diameter of the neck. The current was applied by the minimum number, if possible one, of less than one second impulses, until a short white ring appeared at the neck between the polyp and the tent ([10,11,12,13, 15,16, 23]). The buzzer was switched on. In fact, it helps to know precisely the duration of the current impulse, which is of paramount importance ([11]). HBF coagulation was used in case of non-suspect polyps, especially devoid of any depressed part and measuring less than 10 mm, and, if easy to grasp and if the neck was not larger than 5 mm, on larger polyps up to 15 mm. The polyp was compared with the open forceps to estimate its size. If the patient was awake, he or she was asked to report immediately the slightest pain during the buzzing.

MATERIAL

HBF and snares were ABS material (F88106 Saint Dié France).

RESULTS

A total of 1228 patients underwent colonoscopy during that period. Among 451 patients, we encountered 918 polyps. In the office setting, 666 polyps in 340 patients were explored and 647 were destroyed, 120 by snaring and 527 by HBFP. Under anesthesia at the hospital, among 252 polyps in 111 patients, 241 polyps were destroyed, 41 by snaring and 200 by HBFP. As a whole, 888 polyps were destroyed and 30 left in place deliberately because polypectomy was useless in these cases for miscellaneous reasons. In no instance HBFP failed to grasp and burn the polyp. These results include 41 patients aged 80 and over, who underwent uneventfully HBFP of 69 polyps. Location and diameter of the polyps are detailed in Table 1, as a whole and for the subgroup of aged patients.

Figure 1

Table 1: Location And Diameter Of The Polyps Destroyed With Hot Biopsy Forceps

	Total/ aged 80 and over			
	DIAMETER			
	0-4 mm	5-9 mm	10-15 mm	Total
LOCATION:				
CAECUM	63/6	23/10	6/0	92/16
ASCENDING C.	53/3	19/3	2/0	74 /6
HEPATIC FLEXURE	31/1	12/3	1/1	44/5
				210/27
TRANSVERSE C.	69/4	33/7	4/1	106/12
SPLENIC FLEXURE	12/0	1/0	0/0	13/0
DESCENDING C.	32/5	11/2	3/0	46/7
SIGMOID C.	141/10	28/6	5/0	174/16
RECTUM	156/7	20/0	2/0	178/7
TOTAL	557/36	147/31	23/2	=727/69

Neither pain, perforation nor immediate bleeding were encountered after the HBFP of 727 polyps, including 92 located in the caecum, 74 in the ascending colon and 44 at the hepatic flexure (Table 1). Twenty-three were larger than 10 mm (Table 1). One late (7 days delay) and slight bleeding, failed to necessitate neither blood transfusion nor repeat colonoscopy. It occurred after HBFP of two, 4-mm large polyps of the ascending colon. During the same period 2 other bleedings occurred after snaring of 20 mm sessile

polyps of the sigmoid and of the transverse colon.

One slight post-polypectomy coagulation syndrome, with localized pain but without fever and pneumo-peritoneum was encountered, after the HBFP of 2, 3 mm-large polyps of the caecum. It was managed conservatively on an out-patient basis and vanished within 2 days.

DISCUSSION

The rate of complication of HBF coagulation in the present series is low, even among large polyps, up to 15 mm, and in the right colon. The crossing of informations coming from patient during the following month, from his or her GP and from regional surgeons, makes improbable a noticeable underrating of clinically significant complications. Moreover, most of the patients have been seen for follow-up since the end of inclusion.

The 2 complications were avoidable, because, nowadays, cold biopsy forceps polypectomy is considered to be enough for such diminutive polyps ([1, 9]). Therefore, the main lesson learned is that the present technique is safe on relatively large polyps. The bleeding probability of HBFP in the present study, is about 0.1%, i.e. lower than in other series ([3, 7, 8,9,14,15,16]), but not significantly. This is an acceptable rate, especially taking into account the low seriousness of this bleeding. Only one slight post-polypectomy syndrome occurred, without perforation, i.e. 2 minor complications for 210 HBFP in the caecum, ascending colon and hepatic flexure and none for the 517 performed on the lower parts of the colon.

A further study is presently in progress to increase the power by the inclusion of a larger number of HBFP. However, the present data confirm our long experience and shows that, taking into account an appropriate technique, HBFP does not justify its bad reputation ([1,2,3,4,5,6,7,8,9]), even in the right colon.

In our opinion, the main cause of the accidents lies in the erroneous concept that a low setting of the coagulation device ([1,6, 7, 17, 18]), implying a longer time of coagulation, would be less harmful. On the contrary, in keeping with the opinions of G BOU ([10]) and J.L MADDEN ([12, 13]), according to the electro-surgical principles ([11]) and to day-to-day experience of haemostasis during open surgery, an intense and brief current impulse leads to a quick increase of impedance of the dehydrated tissues which limits the depth of coagulation. This explains also why a low intensity is to be selected if haemostasis ([19]) or deep tumor necrosis are the goals ([10, 12, 13, 20]). Besides, we agree completely with LE Curtiss's statement: “it is useful to remember that short bursts of power by tapping the foot switch are easier to control that one long burst, especially when it is desired to minimize the depth of heating” ([11]).

The amount of heat generated ([3, 11,14]), and, therefore, the rise in temperature, is proportional to the current density (total intensity per cross sectional area i.e. local intensity) squared, times the tissue impedance, times the application time ([11]).

In our opinion, the setting has to be high enough to lead to the appearance of a short white ring on the neck of the polyp within one second. This whitening is the consequence of desiccation, which leads to an abrupt rise of impedance, lessening the power delivered underneath. Grasping the polyp at its top leads to an even distribution of the current and therefore, to the smallest burn compatible with a total destruction of the base ([5]).

A lower setting ([1,2,3,4,5, 7,9, 15,17, 21]) entails a longer time of application (2 to 6 s), leading to a deeper coagulation ([9, 11, 12, 13,19]). It permits a better haemostasis, which is useless for HBFP.

In our opinion, this point explains the high rate of perforation and delayed hemorrhage in some studies ([3, 7]). Waddas and al. ([7]) failed to find a correlation between the seting of the device, the duration of the coagulation and the rate of complication. However, the association of these two parameters was not studied and it is obvious that a high setting is safe only if the duration is minimal. Despite relatively low setting and long duration, JD Waye et al. ([8]) and NS Mann et al. ([21]) failed to encounter complications. It can be hypothesized that the total amount of energy was lower. However, it should be kept in mind that the destruction of the polyp must be complete ([17, 18]), but this point is beyond the scope of the present paper. A further study dealing with this subject is in progress.

Besides, this formula highlights the importance of the diameter of the polyp's neck, because the rise of temperature is proportional to the power of 4 of the diameter ([11, 14, 15, 23]). Therefore, it is of paramount importance to achieve a cross-section as small as possible at the neck of the polyp and as large as possible at the level of muscularis propria and serosa. So, the current density, and, therefore, the heating, are concentrated on the small ring at the neck of the polyp, which, because of it's minimal cross sectional area, is the only to be “cooked”. Because of the much larger cross

sectional area, the heating remains minimal, under the necrosis temperature, at the level of muscularis propria and serosa, preventing any perforation and of sub-mucosa, minimizing the size of the ulceration and, therefore, the probability of a later bleeding.

We underline the importance of a minimal insufflation of the colon to maximize the thickness of its wall and ease the formation of the tent ([3, 9, 15, 21,22]) and of the neck. The importance of the experience of the endoscopist ([8, 9,14, 22]) is of paramount importance for safety and efficiency as well. The performance of polypectomy by trainees ([9]) may explain some bad results from academic centers. In case of any pain, the coagulation must be stopped immediately, by fear of a peritoneal heating ([9, 15]). However, no pain occurred during the present study.

HBFP has the advantages to be quick ([15,23]), frequently easier than snaring for small polyps, and to permit the analysis of a biopsy of each polyp with a precise location. These advantages are particularly important in case of numerous polyps, especially if they can't be sucked off through the working channel.

It is easy to check for complete destruction with an early repeat colonoscopy using the previous location of the biopsy and the ulceration following coagulation ([17, 18]).

In conclusion, HBFP is a safe method, even at office, among right-sided, relatively large polyps and in older patients. Its efficiency has yet to be validated, especially in large polyps.

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References

1. Bond JH, Baillie J. A 68-year-old man with two small colon polyps. Endoscopy 2000;32:647-50.
2. Catalano MF, Hart RS, Scott LD. Delayed hemorrhage after hot biopsy. Gastrointest Endosc 1990;36:536-7.
3. Gilbert DA, DiMarino AJ, Jensen DM and al. Status evaluation: hot biopsy forceps. Gastrointest Endosc 1992;38:753-6.
4. Dyer WS, Quigley EMM, Noel SM and al. Major colonic hemorrhage following electrocoagulation (hot) biopsy of diminutive colonic polyps: relationship to colonic location and low-dose aspirin therapy. Gastrointest Endosc 1991;37:361-4.
5. Quigley EMM, Donovan JP, Linder J and al. Delayed, massive hemorrhage following electrocoagulating biopsy ("hot biopsy") of a diminutive colonic polyp. Gastrointest Endosc 1989;35:559-63.
6. Savides TJ, See JA, Jensen DM and al. Randomized controlled study of injury in the canine right colon from simultaneous biopsy and coagulation with different hot biopsy forceps. Gastrointest Endosc 1995;42:573-8.
7. Waddas DD, Sanowski RA. Complications of the hot biopsy forceps technique. Gastrointest Endosc 1987;33:32-7
8. Waye JD, Lawis BS, Yessayan S. Colonoscopy: A prospective report of complications. J Clin Gastroenterol 1992;15:347-51.
9. Weston AP, Campbell DR. Diminutive colonic polyps: histopathology, spatial distribution, concomitant significant lesions, and treatment complications. Am J Gastroenterol 1995;90:24-8.
10. Bou G. Traitement par électrocoagulation des tumeurs villeuses du rectum (in French) Ann Gastroentérol Hépatol. 1979,15:327-31.
11. Curtiss LE. High frequency currents in endoscopy: A review of principles and precautions. Gastrointest Endosc 1973;20:9-12.
12. Madden JL, Kandalaft S. Electrocoagulation. A primary and preferred method of treatment of cancer of the rectum. Ann Surg 1967;166:413-9.
13. Madden JL. L'électrocoagulation dans le traitement du cancer du rectum (in French) Chirurgie (Paris) 1979,105:15-24.
14. Rosen L, Bub DS, Reed JF III and al.. Hemorrhage following colonoscopic polypectomy. Dis Colon Rectum 1993;36:1126-31.
15. Williams CB. The use of hot biopsy. Endoscopy Review 1985;6:12-7.
16. Webb WA, McDaniel L, Jones L. Experience with 1000 colonoscopic polypectomies. Ann Surg 1985;201:626-32.
17. Peluso F, Goldner F. Follow-up of hot biopsy forceps treatment of diminutive polyps. Gastrointest Endosc 1991;37:604-6.
18. Vagadunas A, Jacob P, Vakil N. Adequacy of "hot biopsy" for the treatment of diminutive polyps: a prospective randomized trial. Am J Gastroenterol 1989;4:383-5.
19. Maroy B. Traitement endoscopique d'une rectite radique hémorragique et ulcérée rebelle par une nouvelle technique d'électrocoagulation. (letter) (in French) Gastroenterol Clin Biol 1998;22:556-7.
20. Maroy B, Lebailly J. Endoscopic electrocoagulation of the digestive tract using a large diameter ball screwed on the flexible device before insertion of the scope. (letter) Endoscopy 2000;32:S71.
21. Mann NS, Mann SK, Alam I. The safety of hot biopsy forceps in the removal of small colonic polyps. Digestion 1999;60:74-6.
22. Nivatvongs S. Complications in colonoscopic polypectomy: lessons to learn from experience with 1576 polyps. American Surgeon 1988;54:61-3.
23. Williams CB. Diathermy-biopsy-a technique for the endoscopic management of small polyps. Endoscopy 1973;5:215-8.

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