

Digestive Endoscopy

Resection rates and safety profile of cold vs. hot snare polypectomy in polyps sized 5–10 mm and 11–20 mm



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ABSTRACT

Background and aims: Hot snare (HS) is widely used for the resection of adenomas >5 mm. The cold snare (CS) has a better safety profile and is more cost-effective. The aims of this study were to evaluate effectiveness and safety of CS polypectomy (CSP) compared to HS polypectomy (HSP) for adenomas sized 5–10 mm and 11–20 mm.

Methods: 4018 colonoscopies performed within “quality certificate for screening colonoscopy” with one polypectomy of an adenoma sized 5–20 mm each were included. Retrieval rates, complete resection rates and complication rates were assessed and compared between CSP and HSP for adenomas sized 5–10 mm and 11–20 mm. Histologic subgroups were additionally assessed.

Results: Complete resection rates (5–10 mm: CSP: 89.4% vs. HSP: 87.9%, $p=0.33$; 11–20 mm: CSP: 81.8% vs. 80.9%; $p=1$), retrieval rates (5–10 mm: CSP: 99.5% vs. HSP: 99.4%, $p=0.76$; 11–20 mm: CSP: 100% vs. HSP: 99%, $p=1$) and complication rates (5–10 mm: CSP: 0.2% vs. HSP: 0.2%; $p=1$; 11–20 mm: CSP: 0% vs. HSP: 1%, $p=1$) were equal between CSP and HSP for adenomas sized 5–10 mm as well as 11–20 mm. For serrated adenomas sized 5–10 mm, HSP was superior to CSP (88.7% vs. 77.2%, $p<0.05$) regarding the complete resection rate, but not for advanced adenomas (HSP: 89.1% vs. 87.3%, $p=0.69$) or adenomas with high-grade dysplasia (HSP: 76.7% vs. 75%, $p=1$).

Conclusion: This study further supports the use of CSP for polyps sized 5–10 mm and additionally suggests also using CSP for polyps sized 11–20 mm. These findings, as well as the best method for resection of serrated polyps should be validated in further studies.

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1. Introduction

The detection and resection of adenomas by screening colonoscopy is the gold standard of colorectal cancer prevention. [1–3] This approach has been shown to reduce colorectal cancer incidence [1,4] as well as mortality [2,5]. In order to reach sufficient colorectal cancer prevention, the detection [6–9] and complete resection of every adenoma is important since incomplete resection is one of the main reasons for interval cancer [9–11].

Hot snare polypectomy is widely used for polypectomy [12]. However, it is associated with side effects including haemorrhage, perforation and postpolypectomy syndrome. Cold snare polypectomy (CSP) is performed without using electrocautery and thus it is considered safer, quicker as well as more cost-effective. [13–18] Two prospective studies recently showed equal complete resection rates between HSP and CSP for adenomas sized 5–10 mm. [16,19]

Serrated polyps [20,21] and advanced adenomas [22] were reported to have an increased risk for incomplete resection. However, there has been no comparison of cold vs. hot snare for these subgroups.

Therefore, the aims of this study were to compare complete resection rates, retrieval rates and complication rates between cold and hot snare polypectomy for adenomas sized 5–10 mm as well as 11–20 mm with the real-life data of the large database of the Austrian certificate of quality for screening colonoscopies. Further-

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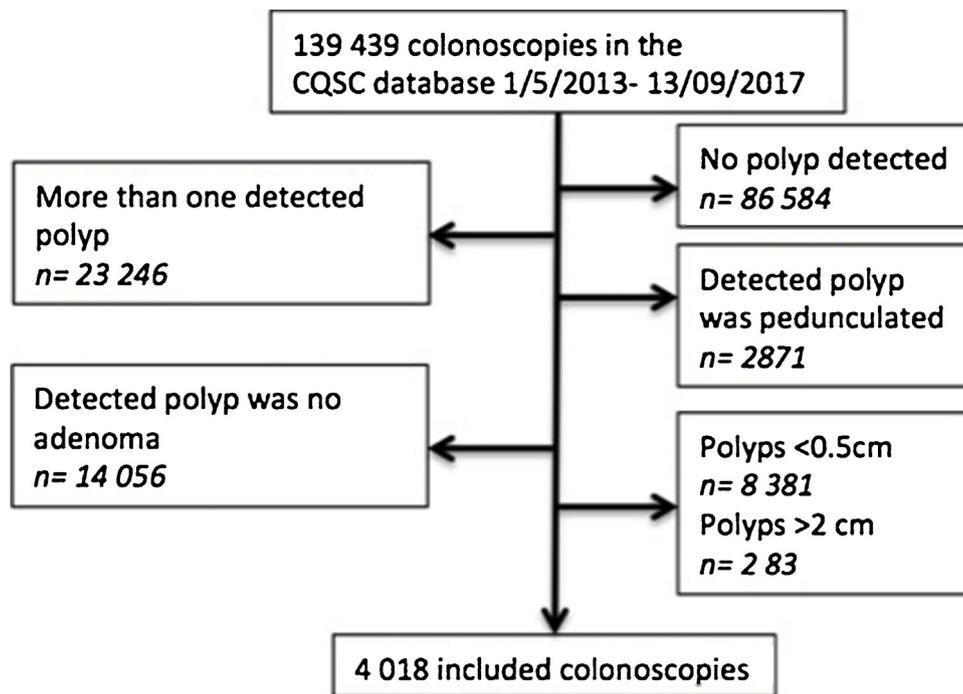


Fig. 1. Flow chart of excluded colonoscopies.

more, we aimed to assess if resection rates differ between serrated adenomas and non-serrated adenomas, between advanced and non-advanced adenomas and between low-grade and high-grade adenomas depending on the snare method. Finally, we aimed to assess if the preferred polypectomy method (hot vs. cold snare polypectomy) depends on clinical practice setting or profession.

2. Methods

2.1. Study cohort

Database records from the CQSC (certificate of quality for screening colonoscopy) were used. The CQSC was founded in 2007 by the Austrian Society for Gastroenterology, Hepatology (OEGGH) and the Austrian Federation of Statutory Insurance Institutions and Austrian Cancer Aid. Details about the project have been published elsewhere. [23–25] In short, Austrian endoscopists can apply for the certificate if they meet special criteria. For participation, they commit to provide records from screening and surveillance colonoscopies. The information regarding specification cold or hot snare for polypectomy exist since 05/2013. Information regarding the completeness of the resection is provided by the histologist and can be rated as complete, incomplete or unclear.

For this study, we included colonoscopies performed within the CQSC between 01/05/2013 and 13/09/2017 in which one sessile 5–20 mm adenoma was detected. We excluded patients, in which more than one polyp was detected.

The study was approved by the ethics committee of the Medical University of Vienna (ECS 1991/2017).

2.2. Statistical analysis

Patient characteristics were described as percentage and frequencies for categorical variables or mean with standard deviation for normally distributed continual variables. Differences of characteristics between the groups were analyzed by unpaired t-tests or Chi-Squared tests, respectively.

Chi-Square tests were used to compare the fraction of completely resected adenomas and the occurrence of complications, respectively, between hot- and cold snare polypectomy. Results are expressed as odds ratios with 95% confidence intervals.

Similarly, the complete resection rates of cold and hot polypectomy were compared between hospitals and private practices and between internists and surgeons by chi-squared test. A p-value of ≤ 0.05 was regarded as significant. All calculations were performed by IBM SPSS statistics version 24.

3. Results

The database of the certificate of quality in screening colonoscopy contained 139439 records between 1.5.2013 and 13.9.2017. In total, we could include 4018 colonoscopies performed in 251 endoscopic units, with one sessile or flat adenoma detected at each procedure (Fig. 1).

The patients' mean age was 62 ± 9.2 and 45.2% were female. The endoscopists consisted of 165 (65.7%) internists, 81 (32.3%) surgeons and 5 (2%) interdisciplinary departments. They were performed in 183 (72.9%) private practices, 65 (25.9%) hospitals and 3 (1.2%) outpatient clinics.

For the resection of adenomas sized 5–10 mm, any snare was used in 2108 (61.6%) colonoscopies. Among snare polypectomies, the cold snare was used in 648 (33.5%) colonoscopies and the hot snare was used in 1289 (66.5%) cases. Most (87.4%) adenomas sized 11–20 mm were resected by HSP.

3.1. Hot vs. cold snare polypectomy in polyps sized 5–10 mm

Including all nonpedunculated adenomas sized 5–10 mm, the retrieval rate was $99.8 \pm 7.5\%$. We did not find differences regarding retrieval rates comparing hot and cold snare polypectomy. Using CSP, 645 (99.5%) polyps could be retrieved compared to 1280 (99.4%) polyps which were resected by HSP (Table 1).

The overall complete resection rate was $88.4 \pm 32\%$. It did not differ between cold and hot snare polypectomy (cold: 89.4% vs. hot: 87.9%, $p = 0.33$) (Table 1, Fig. 2).

Table 1
Retrieval rates, complete resection rates and complication rates for polyps sized 5–10 mm in colonoscopies, in which cold snare polypectomy was performed compared to hot snare polypectomy.

	Cold snare polypectomy	Hot snare polypectomy	p-Value
Retrieval rate	645 (99.5%)	1280 (99.4%)	p = 0.76
Complete resection rate	575 (89.4%)	1130 (87.9%)	p = 0.33
Complication rate	1 (0.2%)	2 (0.2%)	p = 1

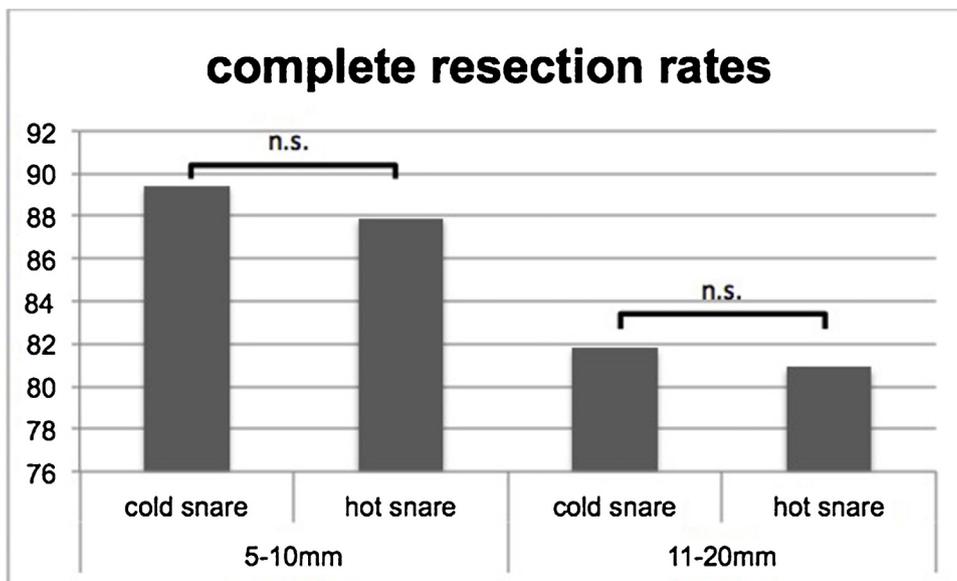


Fig. 2. Comparison of complete resection rates (%) between cold snare polypectomy and hot snare polypectomy for flat adenomas sized 5–10 mm and 11–20 mm.

Table 2
Complete resection rates of adenomas sized 5–10 mm after hot and cold snare polypectomy depending on setting or profession. Differences were calculated with Chi-Square test.

	Private practices	Hospitals	p-Value	Internists	Surgeons	p-Value
Snare polypectomies	1216 (90.9%)	404 (80.8%)	p < 0.01	973 (85.8%)	648 (92.4%)	p < 0.01
Hot snare	776 (90.3%)	308 (81.7%)	p < 0.01	696 (84.9%)	374 (93%)	p < 0.01
Cold snare	440 (92.1%)	96 (78%)	p < 0.01	277 (88.2%)	274 (91.6%)	p = 0.18

Among colonoscopies, in which the hot snare was used, two complications (0.2%) were reported. One cardiopulmonary complication and one complication reported as “other”, which means other than bleeding, perforation or cardiopulmonary. One bleeding event (0.2%) was reported in colonoscopies, in which the cold snare was used (Table 1). All complications could be treated successfully instantly.

3.2. Resection rates of adenomas sized 5–10 mm depending on setting or profession

Private practices showed higher complete resection rates among all snare polypectomies (90.9% vs. 80.8%, $p < 0.01$), among hot snare polypectomies (90.3% vs. 81.7%, $p < 0.01$) as well as among CSP (92.1% vs. 78%, $p < 0.01$). Surgeons had higher resection rates after HSP (93% vs. 84.9%, $p < 0.01$) and among all snare polypectomies (92.4% vs. 85.8%, $p < 0.01$) (Table 2).

3.3. Serrated, advanced and high-grade adenomas sized 5–10 mm

Among colonoscopies, in which the snare was used, there was no difference in resection rates (serrated: 86% vs. all other adenomas: 88.8%, $p = 0.22$). Nevertheless, the resection rate for cold snare polypectomy was lower for serrated adenomas compared to non-serrated adenomas (90.9% vs. 77.2%, $p < 0.01$). Although there was

no difference regarding the resection rates between HSP and CSP in non-serrated polyps, it was significantly lower for serrated polyps if the cold snare was used (77.2% vs. 88.7%, $p < 0.05$) (Supplementary Table 1).

General resection rates among snare polypectomies between advanced adenomas (89%) and non-advanced adenomas (88.1%, $p = 0.66$) were equal. Further, there was no difference in resection rates among CSP (advanced: 87.3% vs. non-advanced: 89.7%, $p = 0.56$) nor among HSP (advanced: 89.1% vs. non-advanced: 87.5%, $p = 0.53$) (Supplementary Table 1).

The resection rate for adenomas with high-grade dysplasia was significantly lower compared to adenomas with low-grade dysplasia (78.2% vs. 88.6%, $p = 0.03$). However, this effect was independent of the snare method in adenomas with low-grade dysplasia (CSP: 89.6% vs. HSP: 88.3%, $p = 0.4$) as well as in adenomas with high-grade dysplasia (CSP: 75% vs. HSP: 76.7%, $p = 1$) (Supplementary Table 1).

3.4. Hot vs. cold snare polypectomy in polyps sized 11–20 mm

Overall polyps sized 11–20 mm which were resected by snare, the polyp was retrieved in 99%. We found no difference regarding kind of used snare (CSP: 100%, HSP: 99%, $p = 1$). The complete resection rate was $81 \pm 39\%$. The resection rates showed no difference (CSP: 81.8% vs. HSP: 80.9%, $p = 1$) (Table 3, Fig. 2).

Table 3

Retrieval rates, complete resection rates and complication rates for polyps sized 11–20 mm in colonoscopies, in which cold snare polypectomy was performed compared to hot snare polypectomy.

	Cold snare polypectomy	Hot snare polypectomy	p-Value
Retrieval rate	55 (100%)	377 (99%)	p = 1
Complete resection rate	45 (81.8%)	305 (80.9%)	p = 1
Complication rate	0 (0%)	4 (1%)	p = 1

Table 4

Complete resection rates of adenomas sized 11–20 mm after hot and cold snare polypectomy depending on setting or profession. Differences were calculated with Chi-Square test.

	Private practices	Hospitals	p-Value	Internists	Surgeons	p-Value
Snare polypectomies	233 (83.3%)	80 (74.1%)	p < 0.05	199 (79%)	143 (85.1%)	p = 0.16
Hot snare	204 (83.6%)	75 (72.8%)	p = 0.03	177 (78.3%)	120 (86.3%)	p = 0.07
Cold snare	40 (81.6%)	5 (100%)	p = 0.58	22 (84.6%)	23 (79.3%)	p = 0.73

In the cold snare group, no complication was reported while in the hot snare group 4 events (1%) were reported. These events were bleeding (2), perforation and one cardiopulmonary complication. (Table 3) All complications could be treated successfully instantly.

3.5. Resection rates of adenomas sized 11–20 mm depending on setting or profession

Private practices had a higher resection rate after HSP (83.6% vs. 72.8%, $p = 0.03$) as well as after snare polypectomies generally (83.3% vs. 74.1%). There was no difference found in the resection rates depending on the profession (Table 4).

3.6. Serrated and high-grade adenomas sized 11–20 mm

The complete resection rate of serrated adenomas resected by snare was 78.3%, compared to 83.5% in other adenomas (tubular, tubulovillous and villous). This was not significant. There was a trend towards a higher resection rates in serrated adenomas after hot snare polypectomy, but this was not significant (CSP: 66.7% vs. HSP: 78.3%, $p = 0.61$) (Supplementary Table 2).

We found no differences in the resection rates in adenomas sized 11–20 mm between adenomas with low grade dysplasia and adenomas with high-grade dysplasia. Similarly, no difference was found among CSP (low grade dysplasia: 84.3% vs. high grade: 50%, $p = 0.15$) as well as among HSP (low grade dysplasia: 81.6% vs. high grade: 70.8%, $p = 0.19$) (Supplementary Table 2).

4. Discussion

This is the largest study comparing the effectiveness of cold snare polypectomy to hot snare polypectomy for polyps sized 5–10 mm and 11–20 mm. For this study, we analyzed 4,018 polypectomies of the database of the Austrian certificate of quality of screening colonoscopy to address the question, if the cold snare is as effective as the hot snare in the resection of adenomas sized 5–10 mm and 11–20 mm, both generally and for several histologic subgroups. It provides further evidence for the usage of cold snare for adenomas sized 5–10 mm as well as 11–20 mm. Interestingly, only serrated adenomas showed lower complete resection rates when resected by CSP.

Kim et al. evaluated residual adenomatous tissue after CSP of adenomatous polyps ≤ 7 mm and reported a sufficient complete resection rate (96.6%) [26]. In another study, the incomplete resection rate of adenomas <10 mm resected by CSP was stated to be only 3.9% [27]. Two prospective, randomized studies recently found equal resection rates in polyps 4–9 mm between HSP and CSP in 538 and 155 patients, respectively [16,19]. Only one small retrospective study found a higher resection rate for HSP compared to

CSP [28]. In one study with 155 patients, the retrieval rates were reported to be equal [19]. Although evidence for non-inferiority of retrieval and complete resection rates are scarce, the recent ESGE guidelines recommend CSP for sessile polyps sized 6–9 mm [29] because of its superior safety profile compared to HSP [13–15,30], lower frequency of abdominal symptoms after the procedure [31], shorter procedure duration [16,31] and lower costs. For adenomas sized 5–10 mm, we found no difference in the complete resection rates and retrieval rates between hot and cold snare polypectomy. Our study thus provides further evidence to support this statement in the actual ESGE guideline.

Complication rates were very low (0,2%) and equally distributed between CSP and HSP. This study was not sufficiently powered to detect differences at such low incidence of complication rates. A better safety profile for CSP has been reported in several studies [13–15,30]. Horiuchi et al. reported absence of delayed bleeding after CSP of colorectal polyps ≤ 10 mm even in anticoagulated patients while in 14% of anticoagulated patients delayed bleeding occurred after HSP [15].

Interestingly, private practices had higher resection rates after HSP, after CSP and generally after a snare polypectomy of an adenoma sized 5–10 mm compared to hospitals. Serrated adenomas, which were associated with a lower complete resection rate in our study and in two other studies [20,21], were found and resected at significantly higher rates in hospitals (13.7% vs. 8.5% of all included polypectomies; $p < 0.01$), but this difference cannot explain the whole difference in complete resection rates of 90.9% in private practices vs. 80.8% in hospitals. One possible reason for the difference in the resection rates might be the presence of residents in training in hospitals, but not in private practices.

Surgeons had a higher complete resection rate compared to internists (92.4% vs. 85.8%, $p < 0.01$). Surgeons found and resected fewer serrated adenomas (6.4% vs. 11.4%, $p < 0.01$). Interestingly, most (97.2%) included surgeons performed the colonoscopies in private practices compared to internists, of which only 66.5% performed the colonoscopies in private practices.

Importantly this study addressed potential differences in resection rates for histological subgroups of adenomas. The hot snare did not lead to higher complete resection rates in advanced adenomas and in adenomas with high-grade dysplasia.

Serrated adenomas were reported to be associated with incomplete resection after HSP and CSP [20,21]. In contrast, we found no differences in overall resection rates and after HSP between serrated adenomas and other adenomas containing tubular, tubulovillous and villous adenomas sized 5–10 mm. However, resection rates for CSP were significantly lower for serrated adenomas compared to other adenomas. Additionally, while we found no difference in resection rates for non-serrated adenomas between CS and HS use, serrated adenomas were significantly less often

completely resected with CSP compared to HSP. Macroscopically, the margin of serrated adenomas is sometimes unclear. This might explain the generally lower complete resection rate in serrated adenomas. Biopsies were not taken more often in serrated adenomas than non-serrated adenomas (serrated: 15.9% vs. non-serrated: 14.9%, $p=0.77$; data not shown) and thus cannot be a reason for differences in resection rates.

These results indicate that serrated adenomas should be resected by HSP. However, the sample size is too small to make a general recommendation (44 serrated adenomas resected by CS). Furthermore, serrated adenomas show a high variation in histologic interpretation by pathologists [32] and closely resemble hyperplastic polyps [33] which have a much higher prevalence [33] and are thought to be not as clinically relevant as serrated adenomas. Thus, before the recommendation to resect polyps looking like serrated adenomas with HS can be considered. The resection rates of serrated adenomas vs. other adenomas should be assessed in further studies.

Current guidelines recommend resecting adenomas sized 11–20 mm with the hot snare [17]. Two small retrospective studies reported a complete resection rate of 80% in 27 sessile polyps sized ≥ 10 mm [34] and 90.3% in 56 non-pedunculated polyps >10 mm [35], respectively, after CSP. In one study with 106 polyps sized 11–14 mm, the complete resection rate was reported to be only 59.4%. As far as we know, no study has compared HSP and CSP for adenomas sized 11–20 mm. We found equal retrieval rates and complete resection rates. Four Complications (1%) were reported after using the HS and none after CS. Thus, this data supports the consideration to recommend the cold snare for the resection of polyps sized 11–20 mm.

It is important to discuss limitations of this study. As it is a retrospective analysis of a prospective database, not all information was available. The completeness of resection was assessed by the pathologist only and we did not perform post-colonoscopy biopsies or follow-up colonoscopies. The inaccuracy might have affected the HSP to a greater extent because the resection margins are damaged after HSP. However, adenomas can be reported to be resected “completely”, “incompletely” and “unclear”. In the included records, 68 (9.7%) adenomas after CSP and 192 (11.5%) adenomas after HSP were reported as unclear complete resection. Resection rates in our study were slightly lower compared to the literature, suggesting some of the adenomas rated as unclear complete resection were in fact a complete resection. Furthermore, the participants of the CQSC enter the data to the database themselves, thus, despite annual random sample checks, the possibility of data entry errors cannot be completely ruled out.

All in all, this study gives further evidence that the cold snare is not inferior to the hot snare for adenomas sized 5–10 mm and should be preferred, regarding the better safety and cost-effectiveness. Additionally, the results suggest using the cold snare also for polyps sized 11–20 mm, in contrast to the current guidelines. This and whether differences should be made if the polyp shows endoscopic features of serrated adenoma should be addressed in further studies to improve safety and effectiveness of screening colonoscopy as colorectal cancer prevention tool.

Conflict of interest

None declared.

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Role of the Sponsors

The funding organizations played no role in the design and conduct of the study, in the collection, management, analysis, and interpretation of the data, or in the preparation, review, or approval of the manuscript.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.dld.2019.01.007>.

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