

Impact of retroflexed view on the detection of lesions in the proximal colon: assessment of 393 patients in a private tertiary hospital

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ABSTRACT – Background – The gold standard test for colorectal cancer screening the colonoscopy. Although this is the test of choice, colonoscopy misses a significant number of lesions, mainly in the proximal colon. With the purpose of reducing the number of lesions missed, new techniques have been studied, amongst them, retroflexed view in the right side of the colon and the second direct forward view. **Objective** – Assessing the safety of the retroview in the proximal colon (cecum and ascending colon), its impact on the detection of lesions in the proximal colon and its advantage over the double right forward view using adenoma detection rate and adenoma miss rate. **Methods** – Three hundred and ninety-three patients who came to Hospital Mater Dei to undergo colonoscopy from March to July 2017, prospectively. Out of these, 372 were included in the study based on the following exclusion criteria: being under 18 years of age, inadequate bowel preparations (Boston scale <7), history of colectomy, inflammatory bowel disease or polypoid diseases. First, an endoscopist inserted the colonoscope into the cecum and examine the cecum and the ascending colon with a forward view twice. In the third insertion into the cecum, retroflexed view was performed, cecal mucosa was examined until the hepatic flexure in search of polyps missed on forward view. All lesions found were resected and sent for histological analysis. **Results** – In 334 (89.8%) patients, retroflexed view was performed successfully, 65.8% of failures were attributed to the loops of the device which prevented the maneuver. The direct view identified 175 polyps in the proximal colon in 102 people. Retroflexed view detected 26 polyps missed by the direct view in 24 (6.5%) people, with a missing rate of 12.9% in the test with only the forward view. Out of the 26 polyps found in retroview, 21 (80.76%) were adenomas, one of them with a high-grade dysplasia. Eleven patients had polyps seen only in retroflexed view. Retroview has increased the polyp detection rate from 27.41% to 31.72% and the adenoma detection rate from 21.77% to 25%. The adenoma miss rate by the double direct view was 12.8%. Without the retroview, one polyp in every 13.91 colonoscopies would be missed (number needed to treat – NNT=13.91). There was no adverse event. **Conclusion** – The retroflexed view technique in the proximal colon was shown to be safe, fast and feasible in most cases. It increased the adenoma detection rate and was shown to be advantageous in this study with benefit beyond the double direct view.

Keywords – Polyp detection; colorectal cancer screening; retroflexed view; increased adenoma detection rate; double direct forward view.

INTRODUCTION

Colonoscopy is regarded as the methodology of choice for colorectal cancer (CRC) screening. Studies show that polypectomy may prevent over 80% of cases of colorectal cancer⁽¹⁻³⁾, despite missing up to 22–28% of polyps and 20–24% of adenomas⁽⁴⁻⁷⁾. This missing of lesions may be explained by several factors: inadequate bowel preparation, the endoscopic technique used, cecal intubation rate and the withdrawal time of the device⁽⁶⁾. In the right colon, the effectiveness of the colonoscopy is lower than in the left colon^(1,7,8,9) due to the impaired visualization of the proximal haustral folds, in the ileocecal valve and in the flexures⁽⁶⁾. Furthermore, the preparation in these areas is usually worse and there is a greater technical difficulty⁽⁷⁻⁹⁾. In order to improve the screening, new techniques have been studied, such as rectal and right-sided colon retroflexed view^(1,10,11) and the second forward view of the right side. The technique of

rectal retroflexed view has been proven safe and increases the polyp detection^(7,12). The technique of right-sided colon retroflexed view and the second forward view have shown to be effective and increased the polyp detection⁽¹³⁾, but there are few studies directly comparing these two techniques and none of them has shown the superiority of one of them⁽¹⁴⁾. Our study has evaluated the safety and the impact of retroview in the right side of the colon, in addition to its advantage after the double direct forward view had been shown by the adenoma miss rate (AMR) of the latter technique.

METHODS

A prospective, cross-sectional, observational and analytical study was conducted to assess patients who sought Hospital Mater Dei to undergo a colonoscopy between March and July 2017. The sample calculation used for the study was the simple random

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sample, in which all elements have the same probability of being selected. Parameters used were as follows: confidence interval of 95%, sample error of 5% and sample power of 80%. And by using the formula (FIGURE 1), the sample size required was 385 cases. Thus, 393 patients were assessed. Exclusion criteria were: patients were less than 18 years old, those with a bowel preparation of less than seven in the Boston scale⁽¹⁵⁾, those patients previously submitted to right-sided colon resection, and those with inflammatory bowel disease or polyp syndromes. The research project was registered in the *Brasil* platform, submitted and approved by the CEP (National Research Ethics Committee – CAAE: 66462917.6.0000.5128) and the Research Ethics Committee of *Hospital Mater Dei*. No informed consent was collected since it was an observational non-intervencionist study.

$$n = \frac{N \cdot Z^2 \cdot p \cdot (1 - p)}{Z^2 \cdot p \cdot (1 - p) + e^2 \cdot (N - 1)}$$

FIGURE 1. Formula of sample calculation.

n: sample calculated; N: population; Z: standardized variable associated with the confidence level; p: true probability of the event; e: sampling error.

Colonoscopy was performed with sedation and accompanied by an anesthetist. The group of endoscopists is formed by eight expert endoscopists with an experience of over 2000 colonoscopies and two trainee colonoscopists accompanied by one of the expert endoscopists. The colonoscopes used were Fujinon EC 530 and EC 500.

First, the endoscopist inserted the colonoscope into the cecum. In this topography, ileocecal valve, appendix orifice and the fusion of tapeworms are seen. After a cautious inspection of the cecum, the colonoscope was withdrawn and the mucosa was carefully examined. Any lesion or polyp found was withdrawn and sent to anatomopathological analysis. After reaching the hepatic flexure, the device was reinserted into the cecum and the mucosa exam was repeated in forward view until the hepatic flexure. After the mucosa exam in forward view was carried out twice, the retroflexed view was performed. The retroflexed view technique was performed with an adjusted device in the ascending colon, with the ‘right’ and ‘up’ commands. After obtaining the retroflexed view image, the ascending colon was analyzed up to the hepatic angle in search of missed polyps. The polyps found in retroflexion were removed by conventional polypectomy techniques, by using biopsy forceps (1 to 4 mm) or snare (when greater than 5 mm) and sent to anatomopathological analysis (FIGURE 2).

The following variables were evaluated: a successful retroview, its complications, the number of polyps found, their size and histology. Adenoma detection rate (ADR) with direct view, ADR with retroflexed view and AMR with a second forward direct view (TABLE 1) were calculated.

RESULTS

From March to July, 2017, 393 patients were assessed. After selecting the patients, 21 of them were excluded according to the following criteria: those with an inadequate bowel preparation according to the Boston scale <7 (9), those who had previously

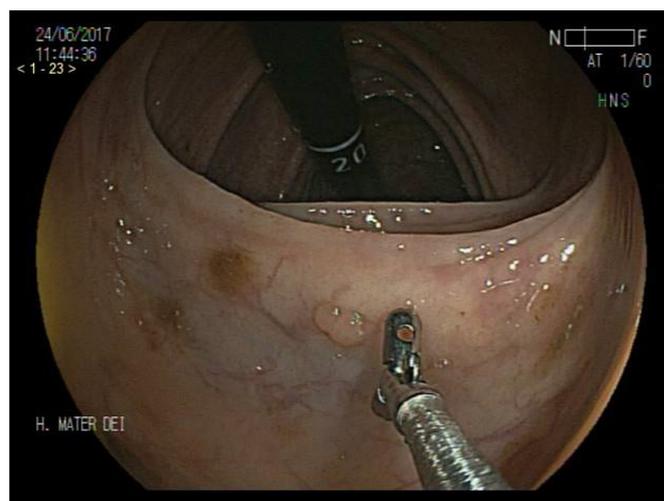


FIGURE 2. Polypectomy in retroflexion.

TABLE 1. Polyp detection in direct view and in retroflexed view.

	Forward view	Retroflexed view
Number of polyps	175	26
Polyp detection rate	27.41%	6.45%
Increase in polyp detection rate	From 27.41% to 31.72% difference of 4.31% (CI95% 10.49–27.14) P<0.001	
Number of adenoma	143	21
Adenoma detection rate	21.77%	5.37%
Increase in adenoma detection rate	from 21.77% to 25.00% difference of 3.23% (CI95% 13.94–42.20)	
Adenoma miss rate		12.80%
Size		
0–5 mm	112 (64.0%)	18 (69.2%)
6–10 mm	47 (26.9%)	7 (26.9%)
>10 mm	16 (9.1%)	1 (3.9%)
Site		
Cecum	37 (21.1%)	0 (0.0%)
Ascending colon	138 (78.9%)	26 (100.0%)
Histology		
Adenoma	143 (81.7%)	21 (80.8%)
Hyperplastic	12 (6.9%)	4 (15.4%)
Serrated	17 (9.7%)	0 (0.0%)
Others	3 (1.7%)	1 (3.8%)

undergone colon resection (7), inflammatory bowel disease or polypoid diseases (4) and others (1). Three hundred and seventy-two patients (over 18 years old) were included in the study. Retroflexed view was performed successfully in 334 (89.8%) patients. Regarding the 38 number of failures, loop formation was the main cause for not performing the retroview (25 patients – 65.8%). In 5 (13.2%) patients there was a technical difficulty and the others (21.1%) were classified as other reasons.

Direct view, in both assessments, identified 175 polyps in the proximal colon in 102 people. Out of these polyps, 143 (81.71%) were adenomas, 17 (9.71%) serrated lesions and 15 (8.57%) hyperplastic (TABLE 1). Most polyps found in direct view (112/64%) measured from 0 mm to 5 mm, 47 (26.9%) from 6 mm to 10 mm and 16 (9.1%) >10 mm.

Retroflexed view in the right-sided colon detected 26 additional polyps (FIGURE 3), which were missed by the double direct view in 24 (6.5%) people. Eight patients had polyps both in direct view and in retroview, 16 other patients had polyps only in retroview, which had been missed in direct view. Out of these patients, 11 did not have any other colorectal polyp besides those seen only in retroflexed view. Polyp detection rate in retroflexed view was calculated by the number of patients with polyps in retroflexed view divided by the total number of patients included (6.45%). Per-polyp miss rate only in forward view was calculated by the number of polyps in retroflexed view divided by the total number of polyps (12.9%) (CI95% 4.32–19.21%). Out of the 26 polyps found in retroview, 21 (80.76%) were adenomas, one of them with high-grade dysplasia and the others had a low-grade dysplasia, 18 (69.2%) adenomas measured from 0 mm–5 mm, 7 (26.9%) 6 mm–10 mm and 1 (3.9%) >10 mm. Retroview increased the polyp detection rate in the right-sided colon (number of patients with polyps only in retroflexed view + number of patient with polyp in direct view/total number of patients included) from 27.41% to 31.72% (CI95%, 10.49–27.14 $P<0.001$). The ADR in direct view was calculated by the number of patients with adenomas in forward view divided by the number of patients included (21.77%). The ADR in retroflexed view was calculated by the number of patients with adenoma in retroflexed view divided by the total number of patients (5.37%). Adenoma detection rate with retroflexed view (number of patients with adenomas detected only in retroflexed view + number of patients

with adenomas in direct view/total number of patients included) increased from 21.77% to 25% (CI95%, 13.94–42.20 $P<0.001$). Adenoma miss rate was calculated by the number of adenomas detected in retroflexed view divided by the number of adenomas found (12.8%). If the retroview were not performed, one polyp in every 13.91 colonoscopies would be missed (number of patients undergoing retroflexed view/number of patients with polyp in retroflexed view = $NNT=13.91$). No adverse event was seen associated with the retroview.

DISCUSSION

Our study was based on seven large studies published in the literature about this subject^(1,6-8,14-17). All of these studies have shown successful retroflexed view in most cases, increase in polyp detection with retroflexed view and no adverse event was seen (TABLE 2). We question why this technique has not been adopted by all services. This is due to the lack of randomized studies and of the analyses of ADR and AMR endorsing this recommendation.

The first study was conducted by Rex⁽¹⁶⁾ in 2004 with a randomized controlled study of 100 patients. The result showed an increase in the detection in the reassessment, but the retroflexed view did not prevail when compared to the second assessment in direct view. This group supported an analogy of the medial wall of the ascending colon with the gastric fundus where the gastric fundus may hide a large lesion from the forward view. Thus, the gastric retroflexed view is recommended. Since it is not usual, a larger group should be studied to show it. Therefore, the group returned⁽⁸⁾ in 2011 with an observational study, but with a larger group of over 1000 patients. This second study showed that the retroflexed view is safe and efficient. However, there was no direct comparison with the second forward view.

In 2015, three studies were published. One of them⁽⁶⁾ was interrupted due to the publication of the other two, a multicenter observational study and a randomized controlled study. The multicenter study was conducted by Chandran⁽¹⁾ who assessed 1351 patients and showed an increase in the detection of polyps in right-sided colon with retroflexed view, but with a slight increased ADR. The randomized study was conducted by Kushnir⁽¹⁷⁾ who evaluated the second view and the retroflexed view in the right-sided colon, but it did not directly compare them. It showed an increased detection with the employment of both techniques, however, there is no comparison to evaluate which one prevails. In our point of view, a technique does not exclude the other. A second view should be performed in the right-sided colon in order to increase polyp detection in forward view. There is still a doubt if there would be an increase in polyp detection if retroflexed view was added after the second view, in addition to both views.

In 2016, Lee⁽⁷⁾ conducted another observational study of 1020 patients with two assessments in direct view before retroflexed view. Even after two meticulous inspections, polyps were still missed and they were only seen in retroflexed view. However, they did not confirm this conclusion by showing the ADR, the AMR and the difference statistical difference of including retroflexed view.

Our study aimed to add to the study of Lee⁽⁷⁾ with this statistical basis. In our study, we have also searched for polyps in double direct view before performing the retroflexed view. Our aim was to reduce the confounding factor found in the two outcomes of the studies conducted by Rex⁽¹⁶⁾ and Kushnir⁽¹⁷⁾ who questioned the increase of retroflexed view as an increase by the second view.

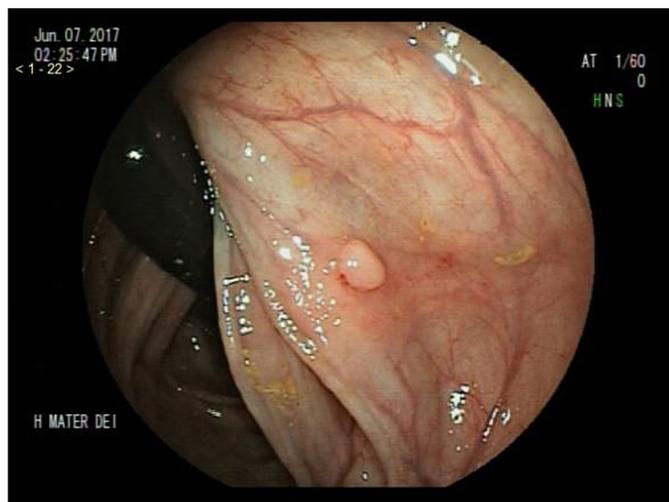


FIGURE 3. Polyp in retroflexion.

TABLE 2. Comparison among five studies with retroflexed view and our current study.

Author	Rex et al. ⁽⁸⁾	Chandran et al. ⁽¹⁾	Kushinir et al. ⁽¹⁷⁾	Triantafyllou et al. ⁽⁶⁾	Lee et al. ⁽⁷⁾	Our results
Year	2011	2015	2015	2015	2017	2017
Study	Prospective controlled study	Prospective controlled study	Randomized controlled trial	Prospective controlled study	Prospective controlled study	Prospective controlled study
Participants	1000	1351	850	674	1020	393
Rate de success in retroflexed view	94.4%	95.9%	93.5%	92%	82.4%	89.8%
Increase in the ADR with retroflexed view (ADR retroflexed – ADR forward)	NA	(26.4–24.64) = 1.78%	(47–46) = 1%	NA	NA	(25–21.77) = 3.23%
Adenoma miss rate	9.8%	NA	7.5%	5.1%	4.9%	12.8%
Adverse events	0	0	0	0	0	0

ADR: adenoma detection rate; NA: not available.

Our group supports the view that the retroflexed view goes beyond the addition of one more view, it is able to see blind spots from the forward view. These blind spots are located in the proximal aspect of haustral folds, in the ileocecal valve and in hepatic and splenic flexures. Our study innovates by comparing the double forward view and the retroflexed view in right-sided colon by using ADR and AMR. This was envisioned by the review of the current literature of Desai⁽¹⁴⁾ whose results showed that there is no statistically significant difference in terms of AMR from an exam after the second direct view when compared to retroflexed view.

Further studies are recommended to divide two direct view in order to verify the increase in detection through a second view and also to add the retroflexed view at a third moment. The AMR is obtained through a forward view regarding the double direct view and the retroflexed view.

Our sample consisted of 393 patients and was considered adequate with power eight, confidence interval 95% and sample error 5%. Three hundred and seventy-two patients were seen during colonoscopy at a private healthcare service. Out of these, 334 underwent a successful retroflexed view and 26 additional polyps were found. The polyp miss rate was 12.9% (CI95% 4.32%–19.21%).

Retroflexed view was achieved in most cases (89.9%) being performed by expert endoscopists and trainees under supervision of a preceptor. This technique was shown to be easy and safe, since there was no adverse event.

Twenty-six missed polyps were found through direct view with a polyp miss rate of 12.9%. Retroview increased the polyp detection rate in the right-sided colon from 27.41% to 31.72% (CI95%, 10.49–27.14 $P < 0.001$). This is statistically significant with the increase in the detection rate, reduction of the number of missed polyps in the right-sided colon, thus improving the CRC screening performed by colonoscopy. Since colonoscopy is the gold standard exam, this finding impacts the public health.

Out of these 26 polyps, 21 were adenomas and one was an adenoma with high-grade dysplasia. Adenoma detection rate in the right-sided colon increased from 21.77% to 25% (CI95%, 13.94–42.20 $P < 0.001$). Adenomas are considered as precursors of colorectal cancer. The ADR is mostly used as a quality of service factor^(16,18). With this significant increase, retroflexed view increases

the quality of service and once again corroborates to the effectiveness of the CRC screening.

The AMR with the double direct view of 12.8% confirms the benefits of complementing the forward view with retroflexed view in the right-sided colon.

A patient with an adenoma with a high-grade dysplasia had only one hyperplastic polyp of the rectum in addition to this one. If this polyp had not been found in retroflexed view, maybe this patient would follow recommendations of ESGE guidelines⁽¹⁸⁾ and the surveillance colonoscopy at 10 years. With this finding of a high-grade dysplasia, a 3-year colonoscopy is recommended, changing the follow-up of this patient. At an individual level, this finding is very significant as well as the eleven patients who only had their polyps seen in the retroflexed view. Although there is no change in their follow-up, there is a change in the report and, therefore, we believe these patients benefited from the retroflexed view and with no adverse event associated to it.

As well as the other six studies^(1,6,7,8,16,17), there was no adverse event in this study.

We have been limited to an observational study, to a small group of examiners, to a selected audience and to the fact that patients are their own control.

Our group adopted the retroflexed view technique in our routine due to the ease of technical execution, how fast it is, the absence of adverse events, the absence of additional costs and the absence of negative effects. And also, mainly, due to its benefits at an individual and collective level with a statistically significant increase in the detection of polyps and adenomas.

CONCLUSION

The retroflexed view technique is reached in most colonoscopies performed by experienced professionals and trainees. No adverse events were seen. The technique of double direct view as well as the technique of retroflexed view in right-sided colon increases the polyp detection. However, the retroflexed view prevailed in this study, with benefits beyond the double direct view. Colonoscopy was more effective due to the increase in polyp detection, i.e. reduction in the number of missed polyps, improving the screening and therefore the survival of the population.

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Authors' contribution

Madureira CM: writing of text, survey execution, data collection. Roda R: survey execution, supervision, text review. Rocha

LCM: survey execution, text review. Coelho DL: text review. Leite FAV: data collection. Lima Junior GF: head of the service and data collection.

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RESUMO – Contexto – O exame padrão ouro para rastreamento de câncer colorretal é a colonoscopia. Apesar de ser o exame de escolha, a colonoscopia perde um número não desprezível de lesões, principalmente no cólon proximal. Com a intenção de reduzir a perda de lesões, novas técnicas são estudadas, dentre elas, a retroflexão em cólon direito e a segunda visão frontal direta. **Objetivo** – Avaliar a segurança da retrovisão no cólon proximal (ceco e cólon ascendente), o seu impacto na detecção de lesões em cólon proximal e sua superioridade sobre a dupla visão frontal direta usando taxa de detecção de adenoma e taxa de adenoma perdido. **Métodos** – Foram avaliados 393 pacientes de forma prospectiva que procuraram o Hospital Mater Dei para realizar colonoscopia entre março e julho de 2017. Desses, 372 foram incluídos baseados nos critérios de exclusão: menores de 18 anos, preparos intestinais inadequados (escala de Boston <7), com antecedente de colectomia, doença inflamatória intestinal ou síndromes polipoides. Primeiramente um endoscopista realizou a inserção do colonoscópio até o ceco e examinou o ceco e o cólon ascendente em visão frontal por duas vezes. Na terceira reinserção até o ceco era realizada a retroflexão e inspeção da mucosa do ceco até a flexura hepática em busca de pólipos perdidos à visão frontal. Todas lesões encontradas foram ressecadas e enviadas para análise histológica. **Resultados** – Em 334 (89,8%) pacientes a retroflexão foi realizada com sucesso, 65,8% dos insucessos foram atribuídos a alças no aparelho que impediram a manobra. A visão direta identificou 175 pólipos no cólon proximal em 102 pessoas. A retroflexão detectou 26 pólipos perdidos pela visão direta em 24 (6,5%) pessoas, com uma taxa de perda de 12,9% no exame apenas em visão frontal. Dos 26 pólipos encontrados em retrovisão, 21 (80,76%) eram adenomas, um deles com displasia de alto grau. Onze pacientes tinham pólipos vistos apenas em retroflexão. A realização da retrovisão aumentou a taxa de detecção de pólipo de 27,41% para 31,72% e a taxa de detecção e adenomas de 21,77% para 25%. A taxa de adenoma perdido pela dupla visão direta foi de 12,8%. Se a retrovisão não fosse realizada, um pólipo a cada 13,91 colonoscopias seria perdido (NNT=13,91). Não houve nenhum evento adverso. **Conclusão** – A técnica de retroflexão em cólon proximal mostrou-se segura, rápida e factível na maioria dos casos. Ela aumentou a taxa de detecção de adenomas e mostrou-se soberana neste estudo com benefícios além da dupla visão direta.

Palavras-chave – Detecção de pólipos; rastreamento de câncer colorretal; retroflexão; aumento taxa de detecção de adenoma; dupla visão frontal direta.

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