

A Single Method to Document the Size of Endoscopically-excised Colorectal Polyps

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Abstract. *Background:* Using polyp-phantoms we previously found a wide inter- and intra-observer variation in size assessment. *Materials and Methods:* Twenty-five endoscopically-resected colorectal polyps were conventionally measured with a millimetre ruler and subsequently placed on a photocopier. Two measurements (one week apart) were made on the photocopies, between two marks limiting the largest dimensions of the polyp. *Results:* On photocopies, one of the values on the 2nd measurement (1/25) underestimated the value of the 1st measurement by 1 mm. On the other hand, disagreement was found in 15/25 when conventional measurements made at routine examination were compared to those assessed on the corresponding photocopies. *Conclusion:* The method described offers several advantages: the pathologist measures the size of the resected polyp on the photocopy at the time of the final histological report. Pathologists are able to re-check the size of the polyp at a later date even if the polyp has already been processed. The filed photocopy is available for other pathologists. Clinicians can assess the magnitude of the removed polyp by a glance at the photocopy. The photocopy can be used to show the true size of the polyp to clinicians and surgeons at clinico-pathological conferences, as well as in future research work. None of the above can be achieved by the present conventional method of assessing the size of endoscopically-resected colorectal polyps.

For many years it has been known that colorectal adenomas may evolve into invasive carcinomas (1-3). Studies performed at the St. Marks Hospital in London (4) showed that adenomas of a large size (≥ 2 cm in diameter) were often associated with invasive carcinoma.

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Key Words: Colorectal, polyps, size, measurement.

Some studies claim that the size of endoscopically removed colorectal polyps given by pathologists is preferable to that of endoscopic estimates (5). In fact, the size given by the pathologist is regarded as the "golden standard" size at most hospitals. In a classic study three pathologists reported that the risk for histologically proven colorectal adenomas to shelter an invasive growth was about 1% for lesions under 1 cm in diameter (4). For adenomas between 1 and 2 cm in diameter, the risk increased to 10% and for those measuring over 2 cm the malignancy rate was nearly 50%. The size proposed by those pathologists (3) has been worldwide accepted as the limits of increased cancer-risk, not only by pathologists (6) but also by radiologists (7) and endoscopists (8, 9).

Pathologists use a conventional ruler to assess the size of endoscopically-resected polyps (5). However, the size calculated with this method may be influenced by several confounding factors such as the skill of the pathologist on duty, the time given to measure the polyp (much influenced by differences in the daily workload) and by the technique used to measure a polyp. In the latter case, some pathologists place the polyp on the working bench facing the ruler, others place the polyp on the ruler and a third group hold the soft, formalin-fixed polyp between two fingers to make the measurement. The latter procedure may exert lateral pressures that might reduce the actual maximal diameter of the polyp. Similarly, when a calliper is used, the arms of the instrument may compress the sides of the soft polyp and induce its deformation, the result being an unwanted error in size estimation.

After the initial measurement, pathologists write down or dictate that size, without re-checking or double-checking the size recorded with another pathologist, before the polyp is cut and processed for histological evaluation. Thus, neither possible intra-observer variations nor possible inter-observer variations in the measurements made with the millimetre ruler are recorded. And yet, the dimensions given by the pathologist on duty remains the "golden standard size" in hospital records, a size transferred to clinical documents and often to scientific reports.

In previous work (10) we studied the accuracy in calculating the size of polyp phantoms with a conventional millimetre ruler. For that purpose, 18 pathologists and 4 surgeons measured the largest diameter of 12 manufactured polyp-phantoms. The results of two independent trials, carried out two weeks apart, were compared with the golden standard size assessed at the Department of Production Engineering, The Royal Institute of Technology, Stockholm, Sweden. Of the 22 experienced participants, 95% in trial 1 and 91% in trial 2 misjudged the size of one or more polyp-phantoms by more than 1 mm when compared to the golden standard. In the first trial 4.9% of the values were misjudged by more than 4 mm while in the second trial this value rose to 5.7%. The highest difference in size given for the same polyp-phantom was 11.4 mm (10). These disparate values were regarded as human error while reading the scale on the ruler. It was concluded that the use of a conventional ruler (the tool of pathologists worldwide) to assess the size of polyp-phantoms often gave unacceptably wide intra-observer and inter-observer variations. The volume and the shape of devices as well as human error in reading the scale of the ruler were confounding factors in size assessment.

Due to the clinical implications of the results obtained (10), it was considered imperative to develop a method that would permit the assessment of the size of removed clinical colorectal polyps with a more acceptable degree of reproducible accuracy. In addition, the method should allow pathologists to re-check the size of any polyp even if the polyp had subsequently been processed for histopathological evaluation.

Materials and Methods

A total of twenty-five endoscopically resected, formalin-fixed colonic (n=19) and rectal (n=6) polyps received at the Department of Pathology were studied. Each polyp was measured with the aid of a conventional millimetre ruler and subsequently placed, with its apparent largest size, on a sheet of translucent paper together with a conventional millimetre ruler and the registration number of the Department on a conventional photocopier (Ricoh, Aficio 2020D). A white paper was placed on top of the polyp and the lid of the photocopy-machine was brought down without exerting pressure on the polyp. The longest exposure time was chosen to photocopy the preparation.

To test if any distortion had been introduced by the procedure, the millimetre ruler used was subsequently placed on the photocopied millimetre ruler. The size of the millimetre ruler corresponded exactly to the size of the photocopied millimetre ruler, indicating that the procedure did not distort the image produced but was in fact a 1:1 copy.

Two opposite marks were traced on the photocopied polyp to demarcate its apparent largest dimensions (Figure 1). The apparent largest dimension of a polyp was defined as the largest that would have been chosen to measure the polyp with a ruler in

routine work, before cutting and processing the polyp. Measurements were made by placing the zero tick mark of the millimetre ruler on one of the dimension marks. When the opposite dimension mark concurred between two contiguous mm lines on the ruler, the outer line was chosen to record the largest size of the polyp.

A second measurement between these two marks on all 25 photocopies was made one week later.

Results

Measurements of endoscopically-resected polyps. The results of measurements using a conventional millimetre ruler of the 25 formalin-fixed colorectal polyps received at this Department are shown in Table I. These measurements were made at routine examination only once (10) (before processing the polyp for histological diagnosis). That procedure is applied at Departments of Pathology, worldwide.

It is seen that the size ranged between 8 mm and 32 mm (mean 17.2 mm).

Measurements on photocopies of endoscopically-resected polyps. Table I also shows the results of the first and the second measurements made on photocopies of the 25 colorectal polyps. It can be seen that in only 1 of the 25 measurements, did the value in the second measurement underestimate the value of the first measurement by 1 mm.

Discussion

From Table I it may be deduced that 15 of the 25 measurements done with a conventional millimetre ruler underestimated (n=12) or overestimated (n=3) the measurements made on the photocopies. It should be mentioned that in a previous study (10), a cohort of pathologists and surgeons measured manufactured polyp-phantoms on two separate occasions using a millimetre ruler. In that work, the concurrence was poor when compared to the golden standard size assessed at The Royal Institute of Technology, Stockholm (10). The results showed that the volume of the polyp-phantoms had influenced the results: polyp-phantoms of a large volume were more difficult to measure with a ruler than polyp-phantoms of a small volume; their shape had also influenced the results. Moreover, some of the participants had misread the scale on the ruler, by up to 6 mm. It was concluded that using a conventional ruler (the tool of pathologists worldwide), unacceptably high intra-observer and inter-observer variations were found when the size of polyp-phantoms were compared to the "golden standard" size. The experience of the first trial had not increased the proficiency in assessing the size of the phantoms in the second trial (10). Moreover, the experience of pathologists (compared



Figure 1. Photocopy of an endoscopically-resected polyp. The two lines demarcate the largest dimension of the polyp. Measurement of the largest dimension was made between the two lines.

to that of surgeons) was of no help in assessing the correct size of the polyp-phantoms (10). Phantoms with different shapes (although similar in size according to the "golden standard") resulted in disparate estimations by the participants (10). Apparently, the volume and the shape of the polyp-phantoms as well as the human error in reading the scale of the ruler were confounding factors in size assessment.

In contrast, when measurements were made on photocopies of endoscopically removed colorectal polyps, a good concurrence was found between the first and the second trials.

The method here described seem to offer several advantages: i) Pathologists can measure the size of the resected polyp on the photocopy, at the time of the final histopathological report; ii) Pathologists may re-check the size of the polyp even if the polyp has already been processed for histopathological evaluation; iii) The photocopy (with the marks showing the diameter) is filed at the Department, thus being permanently available for other pathologists; iv) A copy of that photocopy can be sent to clinicians together with the final histopathological findings; v) Clinicians can assess the magnitude of the endoscopically removed polyp by a glance at the photocopy; vi) The photocopy of the resected polyp can be added to the clinical chart; vii) The photocopy can be used to show the true size of the polyp to clinicians and surgeons at clinico-pathological conferences; viii) The photocopies can be used for future clinical research purposes.

Table I. Measurements (in mm) of 25 endoscopically removed colorectal polyps using a millimetre ruler at routine examination (conventional measurements) and on the corresponding photocopies (first measurement). The latter procedure was repeated blind, one week later (second measurement).

Polyp #	Conventional routine measurements	Photocopy 1st measurement	Photocopy 2nd measurement
1	11 +	10	10
2	18	19	18
3	19 +	17	17
4	8 -	9	9
5	22 -	24	24
6	19	19	19
7	22	22	22
8	16 -	18	18
9	14	14	14
10	21 -	23	23
11	17 -	19	19
12	8 -	10	10
13	32 +	30	30
14	23 -	25	25
15	18 -	19	19
16	19 -	21	21
17	12 -	13	13
18	9	9	9
19	11 -	12	12
20	19	19	19
21	14	14	14
22	12	12	12
23	27	27	27
24	22 -	24	24
25	17	17	17

+ and - refer to deviations in mm from the size obtained in the photocopies.

None of the above can be achieved by the present conventional method of assessing the size of endoscopically-resected colorectal polyps.

The method here described seems to be more reliable than the one being applied to assess the size of endoscopically removed colorectal polyps at routine examination, worldwide.

References

- 1 Feyter F: Zur Geschwulstlehre (nach Untersuchungen am menschlichen Darm): Polypen und Krebs. Beitr Pathol Anat 86: 663-759,1931.
- 2 Swinton NW and Warren S: Polyps of the colon and rectum and their relationship to malignancy. JAMA 113: 1927-1936, 1939.
- 3 Jackman, RJ and Mayo CW: The adenoma-carcinoma sequence in cancer of the colon. Surg Gynec Obst 93: 327-330, 1951.
- 4 Muto T, Bussey H and Morson BC: The evolution of cancer of the colon and rectum. Cancer 36: 2251-2270, 1975.

- 5 Schoen RE, Gerber LD and Margulies C: The pathologic measurement of polyp size is preferable to the endoscopic estimate. *Gastrointest Endosc* 46: 492-496, 1997.
- 6 Martínez ME, Sampliner R, Marshall JR, Bhattacharyya AK, Reid ME and Alberts DS: Adenoma characteristics as risk factors for recurrence of advanced adenomas. *Gastroenterology* 120: 1077-1083, 2001.
- 7 Winawer SJ, Fletcher RH, Miller L, Godlee F, Stolar MH, Mulrow CD, Woolf SH, Glick AN, Ganiats TG, Bond JH, Rosen L, Zapka JG, Olsen SJ, Giardello FM, Sisk JE, van Antwerp R, Brown-Davis C, Marciniak DA and Mayer RJ: Colorectal cancer screening: Clinical guidelines and rationale. *Gastroenterology* 112: 594-642, 1997.
- 8 Hoff G and Vatn M: Epidemiology of polyps in the rectum and sigmoid colon. *Endoscopic evaluation of size and localization of polyps. Scand J Gastroenterol* 20: 356-360, 1985.
- 9 Noshirwani KC, van Stolk RU, Rybicki LA and Beck GJ: Adenoma size and number are predictive of adenoma recurrence: implications for surveillance colonoscopy. *Gastrointest Endosc* 51: 433-437, 2000.
- 10 Rubio CA, Grimelius L, Lindholm J, Hamberg H, Porwit A, Elmberger G, Hoog A, Kanter L, Eriksson E, Stemme S, Orrego A, Saft L, Petersson F, De La Torre M, Ekstrom C, Astrom K, Rundgren A, Djokic M, Chandanos E, Lenander C, Machado M, Nilsson P and Mattsson L: Reliability of the reported size of removed colorectal Polyps. *Anticancer Res* 26: 4895-4899, 2006.

Received July 16, 2007
Revised October 22, 2007
Accepted October 23, 2007