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LETTERS TO THE EDITOR

PillCam® SB3 capsule: Does the increased frame rate eliminate the risk of missing lesions?

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Abstract

Since its emergence in 2000, small bowel capsule endoscopy (SBCE) has assumed a pivotal role as an investigation method for small bowel diseases. The PillCam® SB2-ex offers 12 h of battery time, 4 more than the previous version (SB2). Rahman *et al* recently found that the PillCam® SB2-ex has a significantly increased completion rate, although without higher diagnostic yield, compared with the SB2. We would like to discuss these somewhat surprising results and the new potentialities of the PillCam® SB3 regarding the diagnostic yield of small bowel studies. PillCam® SB3 offers improved image resolution and faster adaptable frame rate over previous versions of SBCE. We recently compared the major duodenal papilla detection rate obtained with PillCam® SB3 and SB2 as a surrogate indicator of diagnostic yield in the proximal small bowel. The PillCam® SB3 had a significantly higher major duodenal papilla detection rate than the PillCam® SB2 (42.7% *vs* 24%, P = 0.015). Thus, the most recent version of the PillCam® capsule, SB3, may increase diagnostic yield, particularly in the proximal segments of the small bowel.

Key words: PillCam® SB2; PillCam® SB3; Capsule endoscopy; Diagnostic yield; Lesions; Frames

Core tip: Rahman *et al* recently found that the 12 h PillCam® SB2-ex has a significantly increased completion rate, although without higher diagnostic yield, compared with the 8 h PillCam® SB2. We compared the major duodenal papilla detection rates

between the PillCam® SB3 and SB2 as a surrogate indicator of diagnostic yield in the proximal small bowel. The PillCam® SB3 had a significantly higher major duodenal papilla detection rate than the PillCam® SB2 (42.7% *vs* 24%, *P* = 0.015). Thus, the most recent version of the PillCam® capsule, SB3, may increase diagnostic yield, particularly in the proximal segments of the small bowel.

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TO THE EDITOR

We read with great interest the paper by Rahman *et al*[1] entitled "Comparison of diagnostic yield and outcomes between standard 8 h capsule endoscopy and the new 12 h capsule endoscopy for investigating small bowel pathology".

Over the last decade, many technical improvements in capsule endoscopy have been made in order to increase its diagnostic yield in small bowel studies, including longer battery time, wider angle of view, faster adaptable frame rate, and improved resolution.

The authors compared the rate of complete examination and diagnostic yield between the PillCam® SB2-ex and PillCam® SB2. The PillCam® SB2- ex offers 12 h of battery, 4 more than the PillCam® SB2.

The authors concluded that the PillCam® SB-ex had a significantly higher completion rate than the PillCam® SB2 (88% *vs* 79.5%), none of the patients having received bowel preparation or motility agents, reflecting that the higher rate of complete studies is real.

However, they were unable to demonstrate a superior diagnostic yield for SB2-ex (35%) over SB2 (48.5%). The authors suggested that this difference may be due to changes in the interpretation of results over time. However, from our point of view, we think that battery extension may not be the key issue for increasing diagnostic yield, since this can be compromised by rapid transit in the duodenum and proximal jejunum, and consequently most missed lesions (including mass lesions) are located in the proximal small-bowel[2-4].

The major duodenal papilla, which is present in all individuals who have not undergone surgery and is located on the medial wall of descending duodenum, 7 to 10 cm distal to the pylorus, may be used as an indirect marker of a possible missed lesion in proximal small bowel in capsule endoscopy studies[5]. Previous studies have reported that the major duodenal papilla is missed in most of small bowel capsule endoscopy examinations[6].

Our experience in small bowel capsule endoscopy shows that the most recent version of the PillCam® capsule (SB3) may increase diagnostic yield, particularly in the proximal segments of the small bowel[7].

Indeed, the PillCam® SB3 improves image resolution and enables a variable frame rate, automatically recognizing the velocity at which it is moving and consequently adjusting the camera to shoot between 2 and 6 frames per second.

Recently, we retrospectively reviewed the last 75 cases of PillCam® SB2 examination and the first 75 cases of PillCam® SB3 examination (up to 12 h of battery life) performed at our center from May 2013 to October 2014. The capsule endoscopic findings of the first tertile were reviewed at a rate of 12 images per second by two experienced capsule readers.

We compared the major duodenal papilla detection rates between the PillCam® capsule SB3 and SB2 as a surrogate indicator of the diagnostic yield proximal small bowel.

We excluded patients whose capsule was placed in the duodenum with endoscopic support, patients who underwent previous surgery, and patients with poor bowel preparation. None of the patients received bowel preparation.

The major duodenal papilla was detected in a total of 50 patients (33%): 18 with SB2 (24%) and 32 with SB3 (42.7%) (*P* = 0.015). The mean number of frames in which the major duodenal papilla was visualized was 7.3 (range 1-63), with no significant difference between the two generations of the PillCam® (*P* = 0.23) (1.7 ± 5.7 and 3.2 ± 8.5, SB2 and SB3, respectively).

Besides the rapid transit of the capsule through the duodenum and jejunum and the possibility of incomplete examination of the small bowel, other factors may also directly impair the diagnostic yield of capsule endoscopy, such as poor view quality, folds and loop angulations hiding lesions, lack of insufflation, and intermittent image capture[4].

Despite increased major duodenal papilla detection with the PillCam® SB3, higher than most studies reported[6], in 57% the major papilla is still not visualized, meaning that the risk of missing significant pathologies in the proximal small bowel decreased but was not entirely eliminated.

Nevertheless, we believe that a variable frame rate according to the speed of the capsule may offer real advantages over a longer battery life, and may be the way to achieve a higher diagnostic yield in small bowel capsule endoscopy, particularly in proximal segments of the small bowel, although further investigation is needed to validate this hypothesis.

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