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Colonoscope Insertion: Is the Future Underwater?

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Inserção do colonoscópio: Será o futuro subaquático?

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It is widely accepted that air or carbon dioxide insufflated into the colon quickly travels to the less dependent segments elongating the bowel and sharpening angulations and flexures, making the procedure more difficult and painful [1]. Most of the pain during colonoscope insertion is felt when negotiating the sigmoid colon and is often due to looping. As the sigmoid is suspended in the abdominal cavity by the mesentery, the left lateral position results in the sigmoid being lengthened and pushed upwards, thereby accentuating its bends and facilitating loop formation [1, 2].

Consequently, colonoscopy is performed under conscious or deep sedation in many countries, regardless of procedure risk, with considerable increases in institutional and social health expenditures, e.g., nursing staff and space for recovery, patient burdens of escort requirement, onsite recovery time after sedation and lost time until returning to routine activities, and increased risks of sedation complications [3].

It would be more rational to improve colonoscopy techniques to avoid generating pain than be compelled to suppress it. As pain is often a result of luminal distention and loop formation, the avoidance of either factor may improve patient comfort. Infusion of water to distend the lumen during the insertion phase eliminates many undesired consequences of gas insufflation, particularly when water is infused in an airless lumen. The colon is not elongated and the sigmoid is straightened, allowing an easier passage into the descending colon; bends and flexures are smoother and easier to negotiate, making the procedure easier and less painful. Moreover, the weight effect of water appears to prevent loop formation at the sigmoid colon [2]. As such, this technique has been used successfully in cases of previously failed cecal intubation.

Into this background comes the article by Azevedo et al. [4]. The study correctly distinguishes between two dif-

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ferent water-aided insertion techniques: water immersion and water exchange.

Water immersion (or infusion or instillation) [5] is an unstandardized technique in which water is infused as an adjunct to insufflation, which is used when strictly necessary. Residual air pockets are used to bypass dirty content, and opaque water is removed as needed to allow a safe progression without maximizing cleanliness during insertion. This approach can reduce the cecal intubation time, subject to patient comfort and luminal view. Most of the infused water is removed during withdrawal.

Water exchange [5], modified from water immersion, is a standardized technique that through infusion and near-simultaneous suction of water entails substitution of all colon content with a layer of clear water, allowing gasless instrument insertion to the cecum without colon elongation and maximizing cleanliness during insertion. For these reasons, infused water is removed predominantly during this phase.

With both techniques, withdrawal is usually carried out using gas insufflation.

A useful check to assure the correct implementation of water exchange is to measure the volumes of water totaled upon arrival to the cecum. Almost as much water is infused and aspirated during insertion; therefore, at the cecum, the discrepancy between infused and aspirated water is small. The amount of water infused during insertion (about 700 mL) has been linked to a significant increase in colon cleanliness by water exchange [6]. This observation raises an interesting point. During water exchange, gas insufflation during insertion is not used for two reasons: to prevent colon elongation (attested by an average length of about 80 cm of instrument at the cecum), and to avoid lack of improvement in colon cleanliness [7]. In a recent randomized controlled trial [6], the significant improvement in cleanliness associated with water exchange was linked to a higher adenoma detection rate compared to the air insufflation group. The increase in adenoma detection rate was confirmed in two other recently published randomized controlled trials. Moreover, the three studies reported a significant increase by water exchange (vs. air insufflation) in lesion detection in the proximal and in the right colon [6, 8, 9].

In everyday clinical practice, hybrid practices of water immersion and water exchange are probably performed at centers where water-aided colonoscopy is not used routinely. However, there are several important differences in outcomes between the two techniques [5]. Of course, endoscopists should be free to perform water-aided colonoscopy in any way they consider convenient. For those wishing to perform the least painful insertion technique, to have better colon cleanliness even after split-dose preparation, and increase lesion detection, also in the proximal and right colon, it would seem prudent to optimize the chance of success by using water exchange from the very start. By doing a hybrid water exchange, the average colonoscopist may forgo its advantages.

The article by Azevedo et al. [4] compares water exchange, albeit with limited use of insufflation, with traditional colonoscopy for several, interesting outcomes. This randomized trial confirms the superiority of water exchange over gas insufflation in reducing colonoscopy insertion pain, which is further attested by higher proportions of painless procedures and patients rating their procedure to be "easier than expected." This was despite the higher baseline anxiety levels in the water exchange group, which are associated with procedural pain and the need for sedation [10]. The fact that the water exchange technique significantly decreased the number of abdominal compressions needed to aid colonoscope insertion probably reflects the reduced rates of loop formation, particularly at the sigmoid [2].

In the study, trainee endoscopists performed 75% of procedures. The different level of expertise of the endoscopists participating in the study could have influenced pain scores and other performance measures. However, the randomized design should have accounted for potential confounders by equally distributing them among the study groups. Insertion time (around 15 min) was comparable between the two study arms, as well as cecal intubation rates that (as randomized) were 93.8% in the air insufflation group and 92.7% in the water exchange group, respectively. Overall, cecal intubation was 1 min 24 s quicker in the water group, and cecal intubation rates were close to screening quality standards (screening cases constituted about half of the study sample). These are remarkable achievements for trainees, and here we find confirmation that they can easily perform water exchange, where the learning curve is not steep, and this is supported by excellent results in terms of colonoscopy key performance indicators. There is definite mileage in evaluating the use of water exchange in the learning phase of colonoscopy, compared with traditional gas insufflation, and this should be explored in future studies.

The authors should also be commended for the clear and thorough discussion about many topics regarding water-aided colonoscopy, focusing on water exchange and providing many appropriate explanations on the nuances of the technique and its impact on colonoscopy.

One limitation perhaps is the authors' choice of primary outcome, which was the patient's recalled maximum pain score. Although this was recorded at the end of the procedure by personnel blinded to the examination, this approach is more commonly used for research purposes and does not allow characterization of the more clinically relevant real-time insertion pain, which determines failure of scheduled unsedated colonoscopy, need for use of on-demand sedation, and need for increasing sedation medication during the procedure. Real-time insertion pain score has been shown to correlate significantly with visual analogue scales and blinded recalled pain at discharge [11–15]. Due to the low proportion of on-demand sedation, it would have been interesting to know which cut-off in pain score was chosen to administer sedation medication. Finally, the study sample was probably adequate to show a significant increase in colon cleanliness by water exchange if the technique had been performed eschewing insufflation.

There are some lessons to be learned from this interesting research article. Even if, for the most part, endoscopists seem to be meeting performance standards without water assistance, this technique offers many advantages to those willing to adapt their colonoscopy technique. Water exchange allows performing a high-quality examination with satisfaction of both endoscopists and patients, can be easily implemented by trainees, and causes less abdominal discomfort. Additionally, water exchange requires less sedation, improves colon cleanliness, and can increase adenoma detection in the entire and proximal-right colon. All these benefits have been consistently reported in many randomized controlled trials.

Changes in medical practice disseminate slowly, especially when air insufflation has been used for decades to perform colonoscopy. The era of water exchange may be key in promoting the concept of "painless colonoscopy" for endoscopists and patients alike. This paradigm shift in mindset is needed to change colonoscopy sedation practices seen across the world today. As such, we should plan to introduce water exchange to trainee colonoscopists at an early stage. As far as expert colonoscopists are concerned, our personal prediction is that the number of those willing to use water exchange will grow steadily in the near future.

Disclosure Statement

The authors have no competing interest to declare.

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