



## Sampling reflex: a relic from the past or a useful parameter for the future?

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We read with interest the paper by Pucciani et al. “Sampling reflex: pathogenic role in functional defecation disorder” [1].

This paper attempts to shed new light on the pathophysiology of dyssynergic defecation using perfused stationary anorectal manometry that for decades has been a very useful tool for clinical and pathophysiological studies. Indeed the authors explore a very complex and controversial issue: the relationship between altered anorectal physiology and functional constipation, in particular, the rectoanal inhibitory reflex (RAIR) and rectoanal excitatory reflex (RAER), i.e. the sampling reflex,

The sampling reflex consists of the RAIR, mediated by relaxation of the internal anal sphincter with simultaneous RAER mediated by contraction of the external anal sphincter that thins the distal zones of the anal canal [2]. It has been suggested that rectal contents are periodically sensed by anorectal sampling. The transient relaxation of the internal anal sphincter (IAS) allows small amounts of endorectal material to descend into the upper anal canal, coming into contact with specialized sensory organs, such as the Krause end-bulbs, Golgi–Mazzoni bodies and genital corpuscles, and the sparse Meissner’s corpuscles and Pacinian corpuscles every 8–10 min. The amount of the relaxation depends on the magnitude of distension. Greater rectal distension can prolong IAS relaxation, and smaller rectal distension can trigger only partial sphincter relaxation. Since the slow-wave activity in the distal part of the sphincter is conjoined with the contraction of the external anal sphincter (EAS)

and puborectalis muscle, this results in the contents being returned to the rectum to prevent fecal leakage. Each of these sampling episodes lasts less than 10 s [3, 4].

An intact sampling reflex allows the individual to facilitate discrimination between flatus and feces and to choose whether to discharge or retain rectal contents. Conversely, an impaired sampling reflex may predispose an individual to incontinence [5]. Thus, its functional purpose is the fine-tuning of the continence barrier. Kaur and his colleagues showed that incontinent patients not only had a greater degree of IAS relaxation with rectal distension but that this relaxation increased with increasing rectal volumes when compared to constipated patients [6]. This implies that with progressive rectal filling with stool, incontinent patients may suffer from an exaggerated relaxation response with subsequent loss of rectal contents through an uninhibited proximal anal canal. From this it follows that an exaggerated reflex could result in fecal leakage, conversely an attenuated RAIR may result in evacuation difficulties [4].

In their study, Pucciani et al. showed that RAIR in patients with functional defecation disorder (FDD) is characterized by the absence of a dose-dependent response, a shorter duration and an incomplete relaxation with high residual pressure at the lowest point of the reflex curve in comparison with healthy volunteers. Thus incomplete IAS opening is reported. This alteration could induce a shorter and less effective contact of the endorectal contents with the typing receptors of the anal canal and could alter the cortical perception. Moreover, the RAIR impairment would not be due only to defective sensorial perception, but also, and primarily, to muscular malfunction. In support of this hypothesis, Pucciani et al. mention that in FDD patients the RAIR impairment is combined with an increased contractile response to rectal distention of RAER. This change could explain the impairment of the sampling reflex in these patients because excessive EAS contraction could prevent complete IAS relaxation.

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This hypothesis might have remarkable therapeutic implications. Indeed, since this function is due to the activity of a voluntary muscle, it could be trainable and improvable by using pelvic floor rehabilitation, as suggested by a previous study in which RAIR incomplete relaxation is corrected by rehabilitative programs combining pelviperineal kinesitherapy and biofeedback which, obviously, are able to act only on striated muscles [7].

Thus, if this finding is confirmed in a larger multicenter studies, pelvic perineal rehabilitation programs of functional defecation disorders should take into account the evaluation of the sampling reflex.

Previous studies showed that patients with constipation have impaired RAIR suggesting the clinical utility of quantitative assessment of RAIR to distinguish the patients with constipation from healthy subjects [8].

However, as Pucciani et al. highlighted, other studies failed to find any RAIR impairment in constipated patients [4, 9] even if the different methodologies, software and instruments used to make it very difficult to compare the results.

Recently, 3-D high definition manometry (HDM) in healthy subjects allowed for a very high-resolution pressure map along the anal canal both longitudinally and circumferentially suggesting an important role of this technique in elucidating the mechanisms of defecation [10]. Up to now, no study has been performed using this new technique to improve our knowledge about the impairment of the sampling reflex in functional defecation disorders.. We agree with Pucciani et al. that the simultaneous evaluation of the entire anal canal, enabling us to have a better knowledge of the pathophysiologic mechanisms of the defecation, could clarify the role of this controversial reflex. To reach this goal it is mandatory that HDM and high-resolution manometry software analysis, which currently show only the presence or absence of the reflex, are implemented providing a quantitative and more precise RAIR evaluation [6].

This might overcome the controversies regarding the diagnostic utility of RAIR in some reported studies using older water-perfused technology.

Further studies are needed to determine if the interesting results provided by Pucciani et al. are simply manometric changes or could play an important role in the management of FDDs.

## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** This article does not contain any studies with human participants or animals performed by any of the authors.

**Informed consent** For this type of study formal consent is not required.

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