



Anorectal manometry with and without ketamine for evaluation of defecation disorders in children[☆]



A.S. Keshtgar^{a,*}, M.S. Choudhry^b, D. Kufeji^a, H.C. Ward^c, G.S. Clayden^a

^a Evelina London Children's Hospital, Guy's and St Thomas' National Health Service Foundation Trust, London, UK

^b Chelsea and Westminster, National Health Service Foundation Trust, London, UK

^c Barts and the London National Health Service Trust, London, UK

ARTICLE INFO

Article history:

Received 8 December 2013

Received in revised form 18 August 2014

Accepted 20 August 2014

Key words:

Anorectal
Manometry
Ketamine
Biofeedback
Endosonography
Constipation

ABSTRACT

Introduction: Anorectal manometry (ARCM) provides valuable information in children with chronic constipation and fecal incontinence but may not be tolerated in the awake child. This study aimed to evaluate the effect of ketamine anesthesia on the assessment of anorectal function by manometry and to evaluate defecation dynamics and anal sphincter resting pressure in the context of pathophysiology of chronic functional (idiopathic) constipation and soiling in children.

Methods: This was a prospective study of children who were investigated for symptoms of chronic constipation and soiling between April 2001 and April 2004. We studied 52 consecutive children who had awake ARCM, biofeedback training and endosonography (awake group) and 64 children who had ketamine anesthesia for ARCM and endosonography (ketamine group). We age matched 31 children who had awake anorectal studies with 27 who had ketamine anesthesia.

Results: The children in awake and ketamine groups were comparable for age, duration of bowel symptoms and duration of laxative treatments. ARCM profile was comparable between the awake and the ketamine groups with regard to anal sphincter resting pressure, rectal capacity, amplitude of rectal contractions, frequency of rectal and IAS contractions and functional length of anal canal. Of 52 children who had awake ARCM, dyssynergia of the EAS muscles was observed in 22 (42%) and median squeeze pressure was 87 mm Hg (range 25–134). The anal sphincter resting pressure was non-obstructive and comparable to healthy normal children. Rectoanal inhibitory reflex was seen in all children excluding diagnosis of Hirschsprung disease.

Conclusions: Ketamine anesthesia does not affect quantitative or qualitative measurements of autonomic anorectal function and can be used reliably in children who will not tolerate the manometry while awake. Paradoxical contraction of the EAS can only be evaluated in the awake children and should be investigated further as the underlying cause of obstructive defecation in patients with chronic functional constipation and soiling.

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Anorectal manometry (ARCM) is used to investigate children with chronic constipation and fecal incontinence but may not be tolerated in the awake child. Previous studies indicated that general anesthesia reduced anal sphincter resting pressure by decreasing the internal anal sphincter (IAS) tone, although it did not affect the qualitative relaxation of the anal sphincter in response to rectal distension [1,2]. Paskins et al. reported that ketamine anesthesia was a suitable sedative for assessment of anorectal function in young children, who are often uncooperative to have awake study and undergo concomitant painful procedures [3]. Ketamine hydrochloride belongs to the phencyclidine

group of drugs, which is a short acting anesthetic with analgesic effects and can be given either intravenously or intramuscularly. There are no reports of serious complications and side effects of vomiting, convulsion, hypertension and hallucination are rare in children [4–6]. During ketamine anesthesia, involuntary movements are often seen and muscle relaxation is poor, hence it is useful for measurement of anorectal manometry profile.

In contrast, ARCM in an awake child provides additional useful information about rectal sensation, dynamics of pelvic floor muscles and function of the external anal sphincter (EAS) muscles. Awake manometry can also be therapeutic as biofeedback training to modify abnormal paradoxical contraction of the EAS muscles (dyssynergia) during attempts at defecation. Dyssynergia of the EAS muscles (anismus) on ARCM is reported in most children with chronic functional constipation [7–10]. To the best of our knowledge anorectal manometry and endosonography in the assessment of the EAS function and defecation dynamics in awake children, without using electromyography, have not been reported previously [10,11].

[☆] Presented at 59th Annual International Congress of British Association of Paediatric Surgeons and European Association of Paediatric Surgeons, Rome, 13–16 June 2012.

* Corresponding author at: Evelina Children Hospital, Guy's and St Thomas' NHS Foundation Trust, King's College, University of London, London SE1 7EH, United Kingdom. Tel.: +44 20 7188 4674; fax: +44 20 7188 4556.

E-mail addresses: ali.keshtgar@gstt.nhs.uk, ali.keshtgar@nhs.net (A.S. Keshtgar).

The aims of this study were to evaluate the effect of ketamine anesthesia on anorectal function by manometry and to evaluate defecation dynamics and anal sphincter resting pressure in the context of pathophysiology of chronic functional constipation and soiling in children.

1. Methods

1.1. Patients

This was a prospective study of children who were referred for further investigation and treatment of chronic constipation and/or soiling to the Intestinal Motility Unit at Guy's and St. Thomas' Hospital, NHS Foundation Trust, London, between April 2001 and April 2004. Ethics Committee of St Thomas' Hospital, National Health Service Trust (NHS) had approved this study in the background of clinical trials using ketamine anesthesia. We obtained informed consent and studied 52 consecutive children who had awake ARCM, biofeedback training and endosonography (awake group) and 64 children, who had ARCM and endosonography under ketamine anesthesia and did not require manual disimpaction of stool from the rectum (ketamine group), reported in our previous studies [12,13]. We included patients who fulfilled the requirement for diagnosis of constipation as defined by Rome II criteria [14]. Patients were excluded from the study if they had underlying anorectal anomaly, endocrine abnormality, neuropathic bowel, learning difficulties and anal sphincter damage on manometry or endosonography.

Of 52 children who had awake ARCM, we age matched 31 as controls with 27 of the 64 children who had ketamine anesthesia and did not have fecal impaction and manual evacuation of stool from megarectum. The children who had anorectal studies under ketamine anesthesia required additional sphincter weakening procedures of anal dilatation, myectomy of the IAS and intrasphincteric injection of botulinum toxin because of severity of their constipation and soiling symptoms. Children who had awake ARCM and endosonography had predominantly symptoms of soiling and less fecal retention hence they did not require any surgical intervention under anesthesia.

1.2. Technique

The techniques of ARCM and endosonography were similar in both awake and ketamine groups. Ketamine was used as a sole agent and was administered at an induction dose of 1–2 mg/kg, and if required additional boluses of the same dose to titrate to effect by an anesthetist and an operating theatre personnel. The patient was breathing spontaneously and vital signs, including respiratory and pulse rates, blood pressure and oxygen saturation were monitored continuously. The duration of anesthesia lasted approximately 20 minutes. None of the children in ketamine and awake groups had premedication or sedation. We used an anorectal probe with four cylindrical anal canal micro-balloons. A latex disposable balloon (condom) was tied to the end of the flexible probe, which was used to record rectal pressure and also to distend the rectum. The stem of the probe was covered with 0.25 in. Paul's tubing to produce four cylindrical anal canal micro-balloons filled with water, located at 1-cm intervals for simultaneous measurement of pressure changes in the anal canal and rectum. The chamber giving the highest anal sphincter pressure reading was used for analysis Fig. 1. The anal canal chambers and rectal balloon were connected to Statham type pressure transducer by stainless steel and nylon tubes and via amplifiers to a personal computer that converted the pressure recordings to digital information in milliliters of mercury (mm Hg). In patients who had ketamine anesthesia, we inflated the rectal balloon with increments of air at an initial volume of 10 ml followed by 50 ml until anal sphincter was completely inhibited or until the balloon was inflated to a maximum volume of 310 ml, which represented the rectal capacity. In awake children, the technique of manometry was similar with exception of maximum balloon volume tolerated by the patient. The total rectal capacity in those children who needed manual evacuation of stool under ketamine was calculated by adding the weight of stool in grams to the maximum rectal balloon volume in milliliters of air [15,16]. The digital information was analyzed by anorectal manometry analyzer (AMA) software, version 3.11, developed by one of the authors (Keshtgar), which exported the data to Microsoft Access®, Excel® and SPSS® package version 17 (SPSS Inc, Chicago, Ill) for statistical analysis [17].

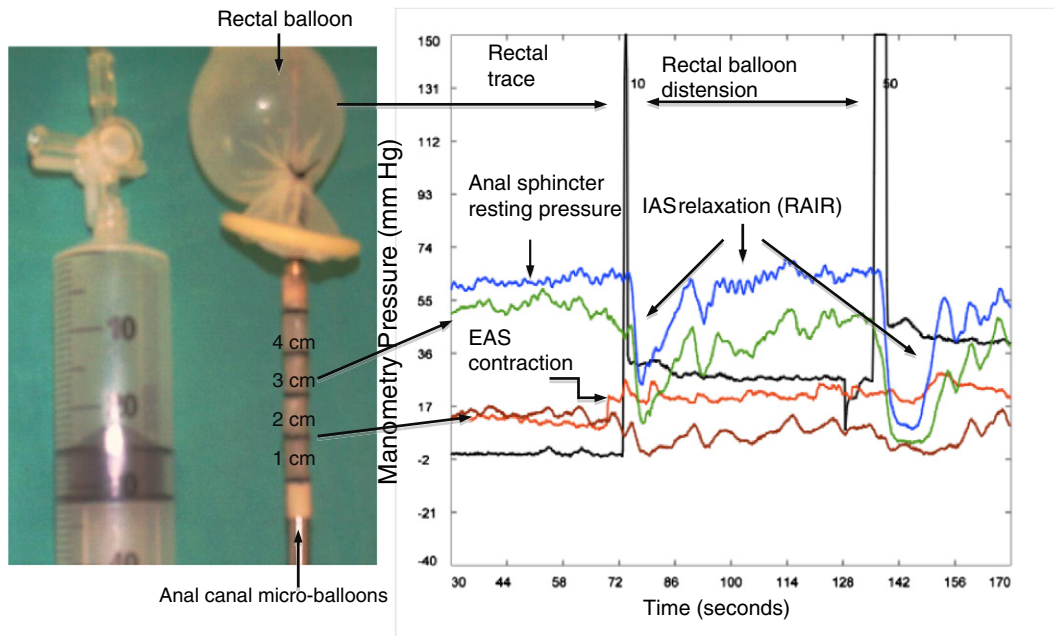


Fig. 1. Normal anorectal manometry study showing rectoanal inhibitory reflex (RAIR) caused by relaxation of the internal anal sphincter (IAS) muscle on distension of a rectal balloon with volumes of 10 and 60 ml air, under ketamine anesthesia. There is simultaneous contraction of the external anal sphincter muscles (EAS) as seen in sampling reflex.

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