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Commentary regarding sedated ultrasound guided saline reduction (SUR) of ileocolic intussusception; 20 year experience

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ABSTRACT

This is a commentary on the manuscript by Sacks R, Anconina R, Farkas E, et al, titled "Sedated Ultrasound Guided Saline Reduction (SUR) of Ileocolic Intussusception: 20 Year Experience".

JPS Commentary.

1. RE: Sedated ultrasound guided saline reduction (SUR) of ileocolic intussusception: 20 year experience

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As physicians who have received a concentrated scientific education, we tend to think of progress in patient care as a forward-leaping march, looking back with a mixture of appalment and derision at the misconceptions of long ago. Yet, at times, we find that we come full circle, and that appropriate results are outcomes from multiple points along that circumference. The treatment of childhood idiopathic ileocolic intussusception is one of those cases.

In the current issue of *Journal of Pediatric Surgery*, Sacks and colleagues report the results of their 20-year-experience reducing intussusceptions with hydrostatic saline enema under sedation in the OR. In doing so, they break with the technique used by most pediatric radiologists in the US, who by a plurality of 96%, use fluoroscopically-guided air reduction, typically without sedation [1].

An eminently treatable condition today, familiar to every pediatric surgeon and pediatric radiologist, intussusception at one time was a lethal affliction. Centuries of trial and error, punctuated by dismal failures and leaps of brilliance, have brought us to our current level of sophistication with essentially 100% survival [2]. In my own pediatric hospital, intussusceptions are rapidly reduced utilizing hospital air introduced into the colon with a 120 mmHg pop-off valve, and the study is undertaken typically within 30 min of the ultrasound diagnosis.

Although air is the most recent advance in the nonsurgical treatment of intussusception, considered among best practices [3], it might surprise many to learn that it is also one of the oldest, first attributed to Hippocrates who apparently advocated both air and hydrostatic enemas for conditions with a common denominator of abdominal distension [4]. After postmortem reduction of an intussusception with air in 1818, Blacklock subsequently used air successfully on living patients. [5] The hand-bellows technique was published in The Lancet in 1837 [6], and again in 1864, with Grieg's report of four successful reductions in five patients, writing: "the remedy is always at hand, even in the poorest cottage." However, these anecdotal reports lacked clinical standardization.

Air and bellows were soon abandoned in favor of hydrostatic techniques, particularly through the published works of Hirschsprung in 1905, reporting a mortality of 23%, dramatically improved over the contemporaneous mortality rate of 90% [7]. However, hydrostatic techniques also lacked clinical standardization. For example, one physician published that "during administration of the enema one should 'lay the child in the hallway and mount the stairs with a fluid reservoir, in order to achieve the greatest pressure." [8]. The decades of the first half of the twentieth century coincided with the development of improved anesthetics and surgical techniques, yet surgical survival was still low, and whether the primary treatment of intussusception was to be by liquid enema or by direct vision under surgery remained controversial. In 1948, Ravitch reported a surgical mortality of 32% at Johns Hopkins Hospital, and undertook the fluoroscopically-guided barium enema for the diagnosis and standardized reduction of intussusception. This resulted in a seminal article that would change the treatment and mortality of intussusception

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for decades to come, by demonstrating that nonsurgical treatment was effective, could be standardized, and success and complications could be monitored [4].

But the winds of change, at times, flow in circles. In 1987 a Caffey Award presentation was made at the Society for Pediatric Radiology by a Chinese radiologist working at Sick Children's in Toronto, describing the successful use of air under controlled and standardized conditions, with 94% success rate [9,10]. In the three decades that have passed since that time, what have we learned regarding the relative advantages and disadvantages of air vs liquid enema as treatment methods? One of the largest studies investigating this question is a meta-analysis that reviewed 102 articles encompassing 32,451 children. [11] These authors found that air had a higher success rate (82.7%) compared to liquid (69.6%) $P < 0.001$. However, perforation rates were not statistically different ($P = 0.73$). Other investigators have found that, in cases of perforation, air produces smaller tears and fecal spillage that is much more contained than with hydrostatic media perforations [12].

Since ultrasound became the mainstay for the diagnosis of intussusception, it was probably just a matter of time until introduction of fluid with ultrasound guidance was tried for nonsurgical treatment. This innovation was also developed in China, with a reported 95.5% success rate [13]. The advantage of this technique, of course, is the lack of radiation, although air reduction in many cases proceeds very quickly, dose with air is lower, [14] and radiation doses with today's fluoroscopes, including pulsed fluoroscopy and fluorosave capabilities, are even lower still. In addition, problems can arise if the child is vigorously uncooperative, which can prevent the transducer from staying on-point over the moving intussusception, or if air is intercalated along the way, such as in children with high grade small bowel obstruction. Extensive expertise in ultrasound and in the ability to scan patients is a prerequisite for the successful application of this technique.

The use of sedation for the children undergoing nonsurgical treatment has been advocated at various times, for various reasons. When I trained at The Children's Hospital Boston in the 1980s, all patients were sedated because it was thought that elimination of straining and Valsalva increased the head of pressure from the barium bag hanging at 3 ft from the table. However, experimental data obtained subsequently have found that the Valsalva maneuver is protective against perforation, [12] and the use of sedation has been largely abandoned in greater than 90% of practices in the US [1].

Although the primary nonsurgical treatment of intussusception is no longer controversial, there is continued discussion and reevaluation of the several largely successful methods currently available to the physicians who care for children with intussusception. Sacks and colleagues report an 86% success rate with no perforations using ultrasound-guided saline enemas under propofol sedation in the operating room. Although best method is often based on institutional expertise and success is also dependent on population and comorbidities, the authors' success rate is comparable to those obtained with other methods and techniques [11]. However, in addition to expertise, all resources are local, and the use of an operating room, plus the delay in hours to secure and transport the patient to such a space, would be highly impractical and not cost-effective in many practices in the US. Nevertheless, this article widens the scope and furthers the discussion on best methods to treat intussusception, emphasizing the importance of local expertise and the fact that there is not a single method to achieve success.

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