

BOWEL PREPARATION OF OUTPATIENTS FOR INTRAVENOUS UROGRAPHY: EFFICACY OF CASTOR OIL VERSUS BISACODYL

Huei-Chen Yang, Ming-Huei Sheu,¹ Jia-Hwia Wang, and Cheng-Yen Chang
Department of Radiology, Taipei Veterans General Hospital, and ¹Department of
Radiology, Far-Eastern Memorial Hospital, Taipei, Taiwan.

The purpose of this study was to compare the efficacy of two laxatives, castor oil and bisacodyl, in the routine bowel preparation of outpatients for intravenous urography (IVU). We used castor oil in patients undergoing IVU for 1 month, and then used bisacodyl in patients undergoing IVU for another month. Two urologists, unaware of the method of bowel preparation, reviewed the standard radiographs and graded the residue in the large bowel and the clearness of the opacified urinary collecting system. In total, 71 consecutive outpatients received castor oil, and 84 received bisacodyl. For the castor oil group, grades from the two urologists did not differ in terms of fecal residue on plain abdominal images ($p = 0.54$), and visualization of the urinary system on the left ($p = 0.36$) and right sides ($p = 0.63$). Findings were similar for bisacodyl recipients ($p = 0.11, 0.59, \text{ and } 0.32$, respectively). When the laxative effect of the two agents was compared, we found no difference in the grading of fecal residue on plain abdominal images ($p = 0.14$), or in visualization of the urinary system on the left ($p = 0.31$) and right sides ($p = 0.98$). In conclusion, we observed no difference in laxative efficacy between castor oil and bisacodyl; thus, bisacodyl may be a useful alternative for bowel preparation before IVU.

Key Words: bisacodyl, bowel preparation, castor oil, intravenous urography, laxatives
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Bowel preparation has long been considered necessary to improve the diagnostic quality of subsequent radiologic examination. Indeed, bowel preparation before intravenous urography (IVU) is recommended in both urologic and radiologic textbooks [1,2]. Almost all medical centers in Taiwan follow this practice. Castor oil and bisacodyl (Veterans Pharmaceutical Plant, Taoyuan, Taiwan) are two commonly used laxatives. Both drugs stimulate smooth muscle in the bowels to increase peristalsis. Castor oil is widely used as the pre-IVU laxative in many hospitals, including ours [3–6]. It is supplied as an emulsion and patients are usually given about 80 mL the

night before IVU. However, patients often find the taste of castor oil unpleasant. Another laxative, bisacodyl, is available as a coated tablet that can be swallowed and is not associated with an unpleasant taste. Thus, the purpose of this randomized, prospective trial was to compare the efficacy of castor oil and bisacodyl for use in bowel preparation in patients undergoing IVU.

MATERIALS AND METHODS

Bowel preparation and IVU

We used castor oil as the laxative in patients undergoing IVU during 1 month, and then bisacodyl in patients undergoing IVU during another month. The laxative was supplied to outpatients, with instructions to ingest it after the meal on the evening before IVU.

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Address correspondence and reprint request to: Dr. Jia-Hwia Wang,
Department of Radiology, Taipei Veterans General Hospital, 201
Shih-Pai Road, Section 2, Taipei 112, Taiwan.
E-mail: wangjh@vghtpe.gov.tw

During IVU, standard radiographs were obtained. After obtaining an initial plain image of the abdomen, 50 mL of contrast material (Ultravist 370; Schering AG, Berlin, Germany) was administered intravenously. Five minutes after the injection, a radiograph (24 × 30 cm) centered over the kidneys was obtained in an anterior-posterior (A-P) projection. Fifteen minutes after injection, A-P, right-oblique, and left-oblique abdominal radiographs (35 × 43 cm) were acquired, with a small pillow and fastened band compressing the lower abdomen to retain the contrast material in the upper part of the urinary system, i.e. if the patient did not have contraindications such as abdominal aortic aneurysm, nephrostomy, or an abdominal wound. Thirty minutes after injection, an abdominal radiograph (35 × 43 cm) was obtained to visualize the whole urinary system, including the urinary bladder.

Image grading

Two urologists without knowledge of the patient's laxative treatment randomly reviewed and graded all images separately and independently. To evaluate the degree of fecal residue on plain abdominal images, the following grading system was created: if there was residue in more than two-thirds of a specific film area (e.g. the area of the location and pathway of the whole urinary system), the score was 0 (Figure 1); if residue was seen in less than two-thirds, but more than one-third, of a specific film area, the score was 1; if residue was seen in less than one-third of a specific area of the film, the score was 2; and if no residual fecal material was seen, the score was 3 (Figure 2).

Another detailed, anatomically based system was developed and used to grade the radiographs. Five areas of interest were examined: the outline of the kidneys; the calices; the renal pelvis; the ureters; and the bladder. The calices were further subdivided into sections: upper, middle, and lower. If the specified section of the urinary system was fully visualized on a radiograph, that section received a score of 2. If it was partially visualized, it was scored 1; and if it was not visualized, it was scored 0. If all three subsections of the calices were visualized, the score was 3; if two were visualized, the score was 2; if one was visualized, the score was 1; and if none were visualized, the score was 0. Thus, a total score was derived for each area of interest, as was a combined total score for the entire collecting system from kidney to bladder. The maximum score was 11 points per side or 20 points per patient (only one urinary bladder) (Figure 3). Although each side was graded separately, the scores were added together for statistical analysis.



Figure 1. Plain image of the abdomen showing a large amount of fecal residue in the large bowel; this received a score of 0.

Statistical analysis

Statistical analysis was performed using the Student's *t* test for each patient's total score. This was done to compare scores, from each urologist, for images obtained from patients given castor oil versus bisacodyl. The reading results of the two urologists were also compared to evaluate discrepancies; for this analysis, we used total scores for the castor oil and bisacodyl groups.

RESULTS

In total, 71 consecutive outpatients were given castor oil as the laxative for bowel preparation, and 84 were given bisacodyl. Detailed statistical results are shown in Tables 1 and 2.

When we compared results for the two urologists, we found no significant difference in the grading of fecal residue on plain abdominal images ($p = 0.54$), or in visualization of the urinary system on the left ($p = 0.36$) and right sides ($p = 0.63$), for patients receiving castor oil. Findings were similar for bisacodyl recipients ($p = 0.11$, 0.59 , and 0.32 , respectively). These statistical results indicated



Figure 2. Plain film of the abdomen showing no fecal residue in the large bowel; this received a score of 3.



Figure 3. Anterior-posterior intravenous urography film (15 minutes after injection of the contrast medium) showing well-opacified and visualized urinary tracts, with maximal scores on the grading system for visualization of the urinary tract.

no reading discrepancy between the two urologists (Table 1).

When we compared the laxative efficacy of castor oil with that of bisacodyl, we also found no significant difference in the grading of fecal residue on plain abdominal images ($p = 0.14$), or in visualization of the urinary system on the left ($p = 0.31$) and right sides ($p = 0.98$). The results indicated no difference in the laxative efficacy of bisacodyl versus castor oil (Table 2).

DISCUSSION

There is disagreement in the literature regarding bowel preparation before IVU. Some authors believe that vigorous catharsis creates excessive gas that compromises the images [5,6]. And, although some clinicians prefer no preparation at all [3–9], textbooks recommend some form of catharsis before IVU [1,2]. In conventional practice, bowel preparation is considered a necessary preliminary step to obtaining good-quality images [1,2]. Many radiologic departments in Taiwan continue to administer bowel preparation before

IVU, despite the opinion that it may be unnecessary.

The purpose of IVU is to visualize the urinary tract: the kidneys, renal collecting systems, ureters, and urinary bladder. We used a grading system to minimize examiner subjectivity and bias similar to the one employed by Schuster et al [6]; thus, our system was based on whether the urinary tract was visualized or not, rather than on whether bowel gas or feces obscured visualization.

Bowel preparation has well-recognized adverse effects, including severe abdominal cramps, nausea, interference with sleep, and fluid and electrolyte depletion [3]. These adverse effects can be especially devastating for bedridden and debilitated patients. Although some authors have reported that radiographs obtained after laxative preparation are clear of feces in 40% of patients [10], other groups have reported that bowel preparation before IVU is unnecessary [3–9]. We do not know the origin of recommendations for catharsis, bowel preparation, and fluid or dietary restriction before IVU. Presumably, these procedures were recommended early on, when the type and amount of contrast material, the radiographic equipment and technique, and the unavailability of tomography provided

Table 1. Interpretation of data from intravenous urography by two uroradiologists

Group	Uroradiologist A		Uroradiologist B		p		
	Mean	SD	Mean	SD			
Castor oil (n = 71)	Fecal residue grade	1.485	0.782	1.529	0.872	0.54	
	Visualization of urinary system on the:	Left	8.485	2.161	9.441	1.856	0.36
		Right	8.779	1.876	9.721	1.572	0.63
Bisacodyl (n = 84)	Fecal residue grade	1.366	0.762	1.500	0.653	0.11	
	Visualization of urinary system on the:	Left	9.122	1.535	8.927	1.748	0.59
		Right	9.293	1.732	9.110	1.873	0.32

SD = standard deviation.

Table 2. Comparison of laxative efficacy between castor oil and bisacodyl

	Castor oil		Bisacodyl		p	
	Mean	SD	Mean	SD		
Fecal residue grade	1.387	0.817	1.529	0.767	0.14	
Visualization of urinary system on the:	Left	8.645	2.158	8.742	2.689	0.31
	Right	7.484	1.807	7.419	2.186	0.98

SD = standard deviation.

poor visualization of upper parts of the urinary tract. In addition, an overlying, stool-filled bowel can easily obscure small renal calculi and the renal outlines. To overcome these problems, we suspect that catharsis was used to eliminate fecal material and gas in the overlying bowel.

In the grading of fecal residue on plain abdominal images, about 45–60% of patients were given a score of 0 or 1, i.e. fecal residue was found in more than one-third of a specific area of the film (these percentages represented 34/71 patients given castor oil, and 49/84 patients given bisacodyl, as graded by one uroradiologist; and 31 and 42 patients, respectively, as graded by the other uroradiologist). Although patients underwent the regimen for bowel preparation (i.e. intake of the laxative the night before IVU, and appropriate food and liquid restriction for about 3 days before IVU), satisfactory bowel preparation was not achieved in almost half the patients. Besides bowel preparation, the quality of urographic examination and visualization of the urinary tracts depend on factors such as habitus, renal function, amount and type of contrast material used, and the radiographic technique and equipment used [6]. In light of the improved quality of today's contrast materials, and the larger volumes used, we believe that visualization of a

urinary tract masked by fecal residue can be improved.

Our results showed no difference, in visualizing various parts of the urinary tract, between castor oil and bisacodyl recipients. Accordingly, bisacodyl may be used as an alternative laxative before IVU. Our study was confined to a relatively ambulatory, outpatient population. We suggest that for more debilitated inpatients, for whom the intake of 80 mL of castor oil is difficult, bisacodyl tablets may be an easier way to achieve the laxative effect.

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REFERENCES

1. Friedenber RM. Excretory urography in the adult. In: Pollack HM, ed. *Clinical Urography*. Philadelphia: W.B. Saunders, 1990:101–24.
2. Pollack HM. Radiologic examination of the urinary tract. In: Stein BS, Caldamone AA, Smith JA, eds. *Practice of Urology*. New York: Norton, 1993.

3. Roberge-Wade AP, Hosking DH, MacEwan DW, Ramsey EW. The excretory urogram bowel preparation — is it necessary? *J Urol* 1988;140:1473-4.
4. George CD, Vinnicombe SJ, Balkissoon AR, Heron CW. Bowel preparation before intravenous urography: is it necessary? *Br J Radiol* 1993;66:17-9.
5. Bradley AJ, Taylor PM. Does bowel preparation improve the quality of intravenous urography? *Br J Radiol* 1996;69:906-9.
6. Schuster GA, Nazos D, Lewis GA. Preparation of outpatients for excretory urography: is bowel preparation with laxatives and dietary restrictions necessary? *AJR Am J Roentgenol* 1995; 164:1425-8.
7. Bailey SR, Tyrrell PN, Hale M. A trial to assess the effectiveness of bowel preparation prior to intravenous urography. *Clin Radiol* 1991;44:335-7.
8. Jackson S, Buxton P, Hacking CN. Bowel preparation before intravenous urography: is it necessary? *Br J Radiol* 1994;67:417-8.
9. Dixon GD. Bowel preparation for excretory urography. *AJR Am J Roentgenol* 1996;166:721-2.
10. Sanders RC, Wright FW. Colonic preparation: a controlled trial of Dulcodos, Dulcolax and Senokot DX. *Br J Radiol* 1970; 43:245-7.

門診病患靜脈注射對比劑泌尿系統 攝影檢查前之腸道準備 — Castor Oil 與 Bisacodyl 兩者有效度之比較

楊慧珍¹ 許明輝² 王家槐¹ 張政彥¹

¹台北榮民總醫院 放射線部 ²亞東紀念醫院 放射線部

本研究目的在於比較 castor oil 及 bisacodyl 兩種輕瀉劑在門診病患的靜脈注射對比劑泌尿道攝影前的常規腸道準備工作之有效程度。我們隨機選擇一整個月的病患服用 castor oil 而另一個月的病患則服用 bisacodyl。由兩位資深的泌尿系統放射科專家在不知道病患服用何種輕瀉劑的情況下對腹部 X 光素片中之糞便殘餘量及注射對比劑後泌尿系統顯影的情況給予分級及計分，再以統計分析其間差異。共有 71 位病患服用 castor oil，84 位服用 bisacodyl，結果發現兩位專家在糞便殘餘量及泌尿系統顯影清晰度的分級及計分上無論病患服用何種輕瀉劑均無統計上之差異 ($p > 0.1$)，至於兩種輕瀉劑的有效程度亦無差異 ($p > 0.1$)。總結本研究可發現 castor oil 及 bisacodyl 輕瀉效果並無統計學上之差異，因此 bisacodyl 可以用於取代 castor oil 作為門診病患靜脈注射對比劑泌尿道攝影前腸道準備之瀉劑。

關鍵詞： bisacodyl，腸道準備，castor oil，
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通訊作者：王家槐醫師

台北榮民總醫院放射線部

台北石牌路二段 201 號