Is the Scout Out? The Utility of Scout Radiographs in the Pediatric Upper Gastrointestinal Examination

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ABSTRACT

Objective: The aim of the study is to demonstrate the scout radiograph does not change patient management, alter planning, or contribute to interpretation of the outpatient pediatric upper gastrointestinal fluoroscopic examination (UGI).

Methods: We retrospectively reviewed 197 outpatient pediatric UGIs performed over a 2-year period. We performed a chart review on all patients to evaluate for potentially clinically significant findings on the scout radiograph. Scout findings were categorized into 4 groups: no new clinically significant findings (group 1), potentially clinically significant findings that were not directly addressed in the electronic medical record (group 2), incidental non-gastrointestinal (GI) findings that necessitated further workup, however, were later deemed insignificant (group 3), and clinically significant findings that changed patient GI management, altered the planning of the procedure, or contributed to the interpretation of the fluoroscopic study (group 4).

Results: A total of 197 UGIs were analyzed. A significant majority of cases (97.0%) were classified into group 1. Three cases (1.5%) were classified into group 2 with findings not addressed in the medical record. Two cases (1.0%) were classified into group 3, which, after further workup, were deemed not clinically significant. One case (0.5%) was classified into group 4, which resulted in a change in patient GI management.

Conclusions: In our review, there was only 1 case in which the scout radiograph changed patient GI management, with moderate stool burden leading to a miralax cleanout, although there were no cases, which altered the planning of the procedure or contributed to the interpretation of the study. The scout radiograph can be omitted and/or substituted with the last image hold function to decrease radiation exposure.

Key Words: fluoroscopy, radiation, scout, upper gastrointestinal series

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What Is Known

- Many institutions perform a scout radiograph before routine fluoroscopic studies.
- Recent studies have shown that scout radiographs may not be necessary.
- Scouts add to the total radiation dose of upper gastrointestinal studies (UGI study).
- Attempts should be made to keep radiation dose As Low As Reasonably Achievable. (ALARA)

What Is New

- Specific evidence to suggest that a scout image for an outpatient pediatric patient undergoing an upper gastrointestinal study does not add any further benefit to planning or interpretation.
- In some instances, a scout image may yield false-positive results that lead to unnecessary patient workup.

The upper gastrointestinal (UGI) study is one of the most common pediatric fluoroscopic examinations performed. With single contrast evaluation, the pediatric UGI series provides an anatomic assessment of the esophagus, stomach, duodenum, and duodenal-jejunal junction (1). Common indications of an UGI study include emesis, dysphagia, feeding difficulties, and gastric tube evaluations.

Many institutions, including ours, obtain a conventional scout radiograph before the UGI procedure (2–4). According to the ACR guidelines, a preliminary chest and/or abdominal radiograph may be helpful, depending on the clinical concern. In the outpatient setting, the ACR guidelines state that the scout radiograph can be replaced with a brief initial fluoroscopic assessment, unless specifically requested by the ordering physician. In the inpatient setting, the ACR recommends obtaining a scout radiograph, although a recent radiograph can serve as a substitute (5).

Although the overall radiation dose for fluoroscopic procedures is relatively low, it is not insignificant, and it still carries a risk to the patient. In particular, pediatric patients are more susceptible to the stochastic effects of radiation due to their increased radiosensitivity with greater cell proliferation and longer lifespan. In accordance with the ALARA principle (As Low as Reasonably Achievable), it is important to minimize radiation dose while maintaining diagnostic image quality (6,7). A recent study by Rao et al concluded that the scout radiograph can contribute a significant portion of the total radiation dose in common pediatric

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fluoroscopic procedures (4). Given that the scout radiograph can contribute a significant dose to the patient, several studies have looked at the contribution of the scout radiograph in different types of fluoroscopic studies (4,7,8). We chose to examine the contribution of the scout radiograph within pediatric UGI examinations, focusing specifically on the outpatient population for several reasons. Within the inpatient neonatal group, the scout radiograph is often used to determine whether to perform an UGI series or contrast enema, depending on the level of obstruction (9). In addition, the outpatient population is much less likely than the inpatient population to have any radiographic abnormality, let alone clinically significant findings.

METHODS

We obtained institutional review board approval with waiver of informed consent for this retrospective study, which complied with the Health Insurance Portability and Accountability Act.

We conducted a retrospective review of all pediatric (0–18 years of age) outpatient UGI studies performed at 2 imaging facilities, including at a large urban academic institution and a nearby outpatient imaging facility, over a 2-year period from January 1, 2014, through December 31, 2015. At the academic institution, examinations were performed in 1 of 3 fluoroscopic suites (Luminos TF and Agile VC10; Siemens Healthcare, Munich, Germany; Kalare and Toshiba Medical, Otowara, Japan), and at the outpatient imaging facility, in 1 fluoroscopic suite (Precision 500D, GE Healthcare, Milwaukee, WI). Each examination was performed by 1 of 2 pediatric radiology attendings (3 years experience, both CAQ certified) or by a radiology resident under the direct supervision of 1 of the 2 pediatric radiology attendings. The patient demographics including age and gender, study indications, scout findings, study impression, and fluoroscopy time were recorded from each radiology report. We also performed a chart review on all patients to determine whether the scout radiograph findings were acknowledged in the electronic medical record, and if so, whether the findings changed the patient's gastrointestinal (GI) management.

We identified 200 studies performed in 199 patients. One patient had 2 studies within 5 months, the latter of which was excluded. One study was excluded due to the absence of a scout radiograph, as an abdominal radiograph had been obtained 3 days before the examination. Another examination was terminated early and therefore, was also excluded. Thus, 197 studies were analyzed.

Analysis of the Scout Radiograph Findings

Each UGI report was reviewed to document the findings on the scout radiograph. Scout findings were broken down into comments relating to surgical hardware, skeletal structures, chest, and abdominal findings. Some examinations had multiple findings on the scout radiograph, and each were reported and tallied individually. A chart review was then performed for all patients to determine if the scout radiograph findings resulted in a change in patient management. Clinician acknowledgment of any findings on the scout radiograph was also documented. Scout images were categorized into 4 groups; no new clinically significant findings (group 1), potentially clinically significant findings that were not directly addressed in the electronic medical record (group 2), incidental non-GI findings that necessitated further workup, however, were later deemed clinically insignificant (group 3), and clinically significant findings that changed patient GI management, altered the planning of the procedure or contributed to the interpretation of the fluoroscopic study (group 4).

RESULTS

The majority of our outpatient upper GI examinations were performed with barium, and a small number of cases were performed with water-soluble contrast (N = 3). Contrast was administered orally, or, in a small subset of patients, via a preexisting nasogastric tube or gastrostomy tube (N = 15). When a dedicated esophagram was performed in an older child or if the indication was to evaluate for a tracheoesophageal fistula, a scout film of the chest and upper abdomen was obtained (N = 19). In all other cases, a scout film of the abdomen including the lower chest to the pubic symphysis was obtained.

One hundred and ninety-seven studies were analyzed including 79 girls (40%) and 118 boys (60%) with a mean age of 3.5 years (see table, supplemental digital content 1, *http://links.lww.com/MPG/B467*). Common study indications included vomiting, reflux, dysphagia, and feeding issues. In 63 cases (32%), no findings were reported on the scout radiograph. One hundred and ninety-four findings were reported in the remaining 134 cases (see table, supplemental digital content 2, *http://links.lww.com/MPG/B468*). Eight patients were noted to have non-GI–related findings on the scout reports that may have been new and clinically significant. After a chart review, it was determined that findings for 3 of those patients were already known and acknowledged in the medical record. Out of the 197 studies analyzed, 186 patients had a follow-up clinical note. Of those patients, the scout radiograph findings were acknowledged in 20 cases, with the most common noted finding related to stool burden (N = 12).

The majority of cases (191/197 or 97.0%) were classified into group 1 with no new clinically significant findings on the scout radiograph. Three of 197 cases (1.5%) were classified into group 2, which included findings that were potentially clinically significant, however, not directly addressed in the electronic medical record. This included one patient with radiographic finding of left hip dislocation without any prior imaging for comparison; however, this was likely a chronic finding in a patient with known cerebral palsy with suggestion of pseudoacetabulum formation (Fig. 1). One

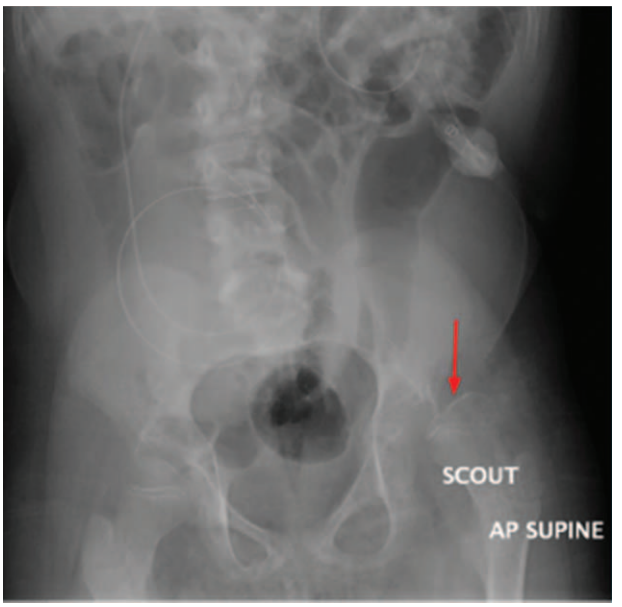

FIGURE 1. Left hip dislocation. Scout radiograph shows a dislocated left hip (arrow) in a patient with cerebral palsy. This was not directly addressed in the electronic medical record and may have been a chronic finding with the suggestion of pseudoacetabulum formation.

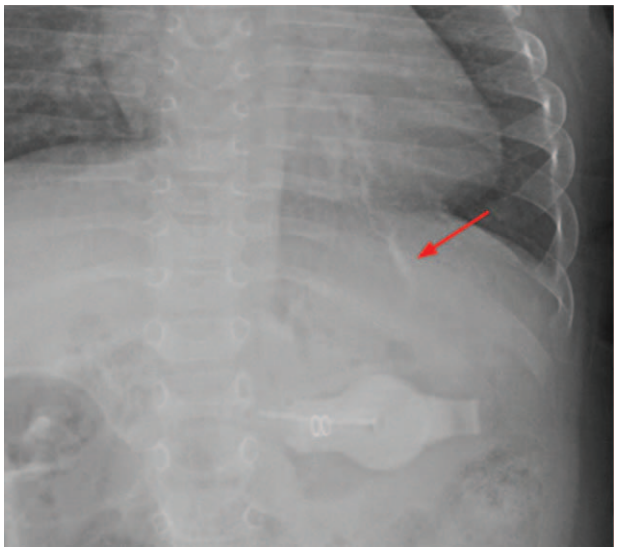

FIGURE 2. Minor linear atelectasis. Scout radiograph shows minor linear atelectasis (arrow) in a patient with a known history of chronic lung disease. This finding was not directly addressed in the electronic medical record.

patient with a history of chronic lung disease was found to have new minor atelectasis (Fig. 2) and another patient was reported to have minor left lower lobe atelectasis, without any prior imaging for comparison. Two of the 197 cases (1.0%) were classified into group 3, which was defined as scout findings that necessitated further evaluation, however, were later deemed insignificant. The 2 cases included a possible pneumothorax and a small pleural effusion. The patient with the potential pneumothorax was sent to the nearby emergency room for further evaluation. Decubitus views showed no evidence of a pneumothorax, and findings were attributed to a skin fold as the patient was entirely asymptomatic. The patient with the suggested small pleural effusion was referred to the pulmonologist; however, no further follow-up was obtained as the patient was

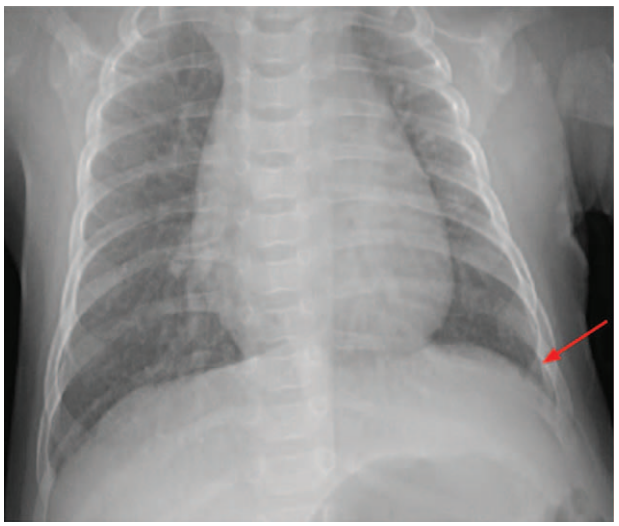

FIGURE 3. Blunting of costophrenic angle. Scout radiograph shows blunting of the left costophrenic angle with a lateral pleural stripe, (arrow), which was suspicious for a trace pleural effusion.

asymptomatic without any significant clinical history (Fig. 3). Only 1 of the 197 cases (0.5%) was categorized into group 4, with moderate stool burden described on the radiograph leading to a miralax cleanout. Of note, there were no studies demonstrating a new clinically significant finding which altered the planning or interpretation of the procedure (see table, supplemental digital content 3, *http://links.lww.com/MPG/B469*).

Regarding the results of the fluoroscopic examination, 53% of cases were normal. Of the remaining cases, the most common finding was reflux (see table, supplemental digital content 4, *http://links.lww.com/MPG/B470*). Of note, there were 5 cases of suspected aberrant subclavian artery, 4 cases of diaphragmatic hernia, 5 cases of mildly low lying duodenojejunal junction and 1 case of surgically confirmed malrotation without volvulus. Again, there were no cases in which the UGI scout imaging findings contributed to the interpretation of the UGI study. The average fluoroscopic time for all studies was 43 seconds.

DISCUSSION

The purpose of the pre-procedural scout radiograph is to detect findings that may factor into the decision of whether or not to perform the procedure, or findings that will change the planning or interpretation of the procedure. In neonates, if not already obtained, the scout radiograph can help determine whether an UGI or contrast enema examination is warranted, depending on the level of obstruction. Specifically, the abdominal radiograph should be assessed for calcifications, situs anomalies, bowel gas pattern, pneumoperitoneum, evidence of prior surgery, catheters/devices, and the presence of enteric contrast from a prior study. The chest radiograph can be helpful to assess for the presence of pneumomediastinum and pleural effusion. It has been our experience that detecting such abnormalities on a scout radiograph for any patient is a rarity, and is even more uncommon in the outpatient population.

Domina et al showed that the scout radiograph did not appear to augment the interpretation of 181 VCUG examinations or contribute to the clinical management of the patient. In this review, the effective dose of scout radiographs ranged from 0.09 to 0.18 mSv (10). A more recent study looked at the scout contribution of multiple fluoroscopic examinations including contrast enema, upper GI series, and voiding cystourethrograms (11). In this review, there were no new clinically significant findings in 99.4% of cases, and new but clinically insignificant findings in 0.6%. There were no cases in which the scout radiograph altered the examination performed or changed clinical management.

In our review of 197 outpatient pediatric UGI studies, a significant majority of scout radiographs (97.0%) did not reveal any new significant findings. Three cases (1.5%) resulted in potentially clinically significant findings that were not directly addressed in the electronic medical record. Although lacking direct evidence by clinician acknowledgement in the patient's electronic medical record, these findings were likely of no clinical significance. There were 2 cases (1.0%) of findings that necessitated further workup, however, were later deemed not significant after further assessment. An argument can be made that these 2 cases were artifactual/incidental findings that necessitated unnecessary further workup leading to increased patient and/or caregiver anxiety as well as additional medical cost. We found only 1 instance (0.5%) in which the scout radiograph findings were documented to change patient GI management. This was a case in which the patient was noted to have moderate stool burden and was prescribed a laxative.

Other disadvantages of obtaining a scout radiograph include the financial and temporal cost. At our institution, a scout radiograph before an UGI fluoroscopy examination results in an

approximately 4.5% increase in charge for the examination. Although seemingly small in amount per examination, when multiplied over many examinations, this is not an insignificant cost. The temporal cost includes the time it takes the technologist to acquire the image, the interpretation time by the radiologist, and the overall added examination time for the patient and caregiver.

Given these costs and risks, we believe our findings further support recent research that a scout radiograph is not always necessary in pediatric fluoroscopic examinations (4,10,11). Although the single case of moderate stool burden resulting in laxative treatment is relevant, we recommend that if an evaluation of stool burden is clinically warranted, then a scout radiograph may be requested or substituted with the last image hold function on a case by case basis. It is not justifiable to subject all other patients and caregivers to the increased risks and costs of a scout radiograph, given the minimal demonstrated benefit.

Limitations of our study included the heterogeneity of the field of view of the scout radiograph. In cases in which complaints of dysphagia predominated in an older child, a scout of the complete chest was obtained. In the majority of cases, a scout of the abdomen was, however, obtained with variable portions of the lower chest included. This may have contributed to the increase in chest findings in our study compared to others. Another limitation was the retrospective nature of this review, which resulted in some cases in which the clinical significance of a scout finding could not be determined with complete certainty.

Our results support the recent wave of research suggesting that scout radiographs may not be necessary in certain pediatric fluoroscopic studies. Instead, the argument has been made that the scout radiograph may be substituted by using the last image hold function (4). In the setting of an acute abdomen, the perioperative setting, or in the inpatient population, a scout radiograph may be warranted depending on the clinical scenario. The possibility that a scout radiograph will alter a patient's management in cases of outpatient UGI studies is, however, highly unlikely. Thus, the scout may be omitted or substituted with a last image hold to decrease radiation exposure.

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