Predocedure Abdominopelvic Computed Tomography: How Does Waiting Time Affect The Patient.

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Purpose

- To assess the waiting time prior to patient undergoing abdominopelvic CT under various circumstances.
- To assess patient compliance in the various groups.
- To detect the common problems faced by the patient and ways to rectify them.
- We compared the demographics of these groups having the chance of anaphylactoid reactions with those having nonanaphylactoid and none.
Study/Project design

Total 2400 cases with different oral contrast preparation were included. Contrast agents and patients were chosen in a randomized order.

Their ages ranged from 20 to 80 years (mean, 54.6 years); 49% patients were scanned as outpatients, 26% as inpatients, and 24% in the emergency department. All CT scans were performed with IV iopromide (Ultravist) at a dose of 75-100 mL of 300 mg I/mL or 125-150 mL of 370 mg I/mL. The higher dose was used only for patients who underwent CT angiography (including scans to detect pulmonary emboli). Unless contraindicated, contrast agent was injected with a mechanical power injector. Flow rates varied: 3 mL/sec was used for chest, abdominal, and pelvic CT scans; 1-2 mL/sec for head, neck, and musculoskeletal CT scans; and 3-4 mL/sec for CT angiograms.

Before contrast agent administration, all patients completed a standardized form used in the radiology department to screen for contrast reactions. Patient age, sex, and weight and the type of study were identified. Relevant patient history, including symptoms, known diseases, and concurrent medications, was recorded. In addition, risk factors for contrast agent administration or development of adverse events were identified.

All patients between 20 to 60 yrs were selected. Individual subject received single type of oral contrast preparation. Older age group patients and subjects with gastrointestinal disease, previous abdominal surgery, and symptoms of gastrointestinal disorders such as diarrhea were excluded.

Patients having known risk factors for developing reaction to iodinated contrast media were also excluded.

(A.) Patients were divided into various groups:

1. Based on the indication and emergency
2. Based on the type of preprocedure preparation given to the patient (no preparation, water, oral contrast or mannitol)

(B.) Assessment of the patient compliance in the various groups.

(C.) Documentation of the various limitations and complications in the different groups.
(D.) Finally to define the best preprocedure preparation in accordance to the indication and patient compliance.

BASED ON INDICATION:

1. Anatomical site being scanned.
2. Emergency / nonemergency CT.

BASED ON PREPROCEDURE PREPARATION:

Subjects are divided into 8 groups with 300 patients in each group.

1. Group 1: Mannitol dissolved in of tap water with added edible orange colour.
2. Group 2: plain water with added edible blue colour.
3. Group 3: was prepared with angiograffin (60%) in tap water with added edible red colour.
4. Group 4: was combination of mannitol and angiograffin dissolved in plain water with edible yellow colour.
5. Group 5: Mannitol dissolved in of tap water with no added edible colour.
7. Group 7: was prepared with angiograffin (60%) in tap water with no added edible colour.
8. Group 8: was combination of mannitol and angiograffin dissolved in plain water with no added edible colour.

Data Analysis

Descriptive analyses of the variables, comparisons of means, and proportions using Student’s $t$ and chisquare tests, and logistic regressions were conducted. Patients who experienced adverse events and patients who did not were compared to evaluate differences in age, sex, dose of contrast agent (in grams of iodine), patient's status during study (i.e., inpatient vs outpatient vs emergency department patient), and time of study (i.e., month, season, and year).
Results

Descriptive analyses of the variables, comparisons of means, and proportions using Student's t and chisquare tests, and logistic regressions were conducted.

Patients who experienced adverse events and patients who did not were compared to evaluate differences in age, sex, dose of contrast agent (in grams of iodine), patient’s status during study (i.e., inpatient vs outpatient vs emergency department patient), and time of study (i.e., month and season).

Adverse events were observed in 111 patients (14.4%) and were categorized as follows: urticaria \( (n = 87) \), facial or laryngeal edema \( (n = 7) \), bronchospasm \( (n = 6) \), severe nausea or vomiting \( (n = 3) \), or other \( (n = 8) \). 89% were rated mild, 9%, and 2%, including one fatality. Adverse events required treatment in 42%.

72 females, 39 males; age range, 24-80 years; mean age, 50.5 years experienced adverse events. Of these, 73% were outpatients, 10% were inpatients, and 17% were emergency department patients.

Analysis of the subgroup of patients with adverse events (40.8%) scanned after June, 2009, showed that the dose of iodine was 22.5-30 g in 85% and 46.25-55.5 g in 15%.

Despite immediate treatment, the patient experienced cardiac arrest soon after and died. 59% were treated with observation only and 41% with a specific treatment.

Diphenhydramine was administered to 71 patients, methylprednisone to five patients, and epinephrine to five patients.

Three patients were immediately transferred to the emergency department, and the code team was called for three patients. Information on treatment was not available for four patients.

No statistically significant relationship was found between the incidence of adverse events and patient age \( (p = 0.69) \), contrast agent dose \( (p = 0.41) \), or time of study (month \( [p = 0.9] \), season \( [p = 0.58] \). However, a statistically significant relationship was present between the incidence of adverse events and the female sex \( (p < 0.001) \).
Also, outpatients were more likely to experience adverse events after iopromide administration than were inpatients and emergency department patients ($p < 0.001$).

The logistic regression analysis shows that the incidence of adverse events was 3.6 times higher (statistically significant) in females than males and 5.5 times higher in outpatients than others.

Colored contrast media ($p < 0.001$) had a statistically significant higher incidence of adverse events.

We noted that patient who received colored oral contrast media had higher incidence of mild type of contrast reaction, however the incidence of moderate to severe grade of contrast reactions were equal to those who received noncolored oral media.
ETIOLOGY OF CONTRAST REACTIONS

There are 2 basic types of contrast reactions; the first is the anaphylactoid or idiosyncratic, and the second is the nonanaphylactoid. Contrast reactions may occur from either one or a combination of both of these effects.

Anaphylactoid/Idiosyncratic Reactions
As the name suggests, the exact etiology for these reactions is less well understood, and they tend to mimic an anaphylactic (allergic) reaction. The proposed mechanism of these reactions includes enzyme induction, causing the release of vasoactive substances such as histamine and serotonin and the activation of a physiologic cascade and eventually the complement system.

These are the most frequent type of adverse reactions and may have serious, occasionally fatal, complications. These reactions are more frequent in patients with asthma (5 times), patients with previous reactions (4-6 times), patients with cardiovascular and renal disease, and individuals on #-blockers.

Anxiety, apprehension, and fear may play a part in this type of reaction. Such reactions usually begin within 20 min of injection and are independent of the dose administered.

Symptoms associated with anaphylactoid reactions are classified as mild (skin rash, itching, nasal discharge, nausea, and vomiting), moderate (persistence of mild symptoms, facial or laryngeal edema, bronchospasm, dyspnea, tachycardia, or bradycardia), and severe (life-threatening arrhythmias, hypotension, overt bronchospasm, laryngeal edema, pulmonary edema, seizure, syncope, and death).

Nonanaphylactoid Reactions
Nonanaphylactoid reactions are also called physiochemotoxic or nonidiosyncratic reactions. These reactions are believed to result from the ability of the contrast media to upset the homeostasis of the body, especially the blood circulation.

These reactions are dependent on the physical properties of the contrast medium such as ionicity (which causes free ions in the circulation, which in turn may disrupt electrical charges associated with nervous or cardiac activity) and osmolality (which causes large shifts in fluid volumes).
Increasing iodine concentration also increases the risk of these reactions. Finally, the volume and route of administration of contrast also increase the likelihood of such reactions (larger volume or intraarterial administration are more likely to produce a reaction).

The cardiovascular, respiratory, urinary, gastrointestinal, and nervous systems are most commonly affected by physiologic changes produced by contrast media. The symptoms of nonanaphylactoid reactions are warmth, metallic taste, nausea, vomiting, bradycardia, hypotension, vasovagal reactions, neuropathy, and delayed reactions.
Conclusions

Waiting time prior to abdominopelvic does affect the patient.

Appropriate decision making helps in decreasing the waiting time and getting the best of the imaging.

Clinical assessment of the patient and indication for the CT should be kept under consideration before planning the preprocedure preparation.

Flexibility of the radiologist and proper patient assessment not only increase the patient compliance, it also increased the diagnostic yield.

Iodinated contrast media are frequently used and are safe. Reactions, when they occur, are usually mild but may occasionally progress to life-threatening proportions. A thorough understanding of the etiology, predisposing factors, symptoms, and management strategies is effective in minimizing the threat posed by these factors.
References

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