PRACTICAL GUIDE TO HANDLING OF PEDIATRIC PATIENTS FOR INTRAVASCULAR ADMINISTRATION OF CONTRAST MEDIA

GENERAL PRINCIPLE:

Administration of intravascular contrast media enhances the vascular structures and various organs of the body, and the over-all image quality of radiographic procedures. Although rare, adverse contrast reactions (ACRs), contrast-associated acute kidney injury (CA-AKI) and other complications can be observed even in children. Screening of patients should be done to minimize such unpredictable events. Prompt recognition, assessment and appropriate treatment of complications are thus of utmost importance, if these do occur.

SPECIFIC GUIDELINES:

A. Proper assessment of patients shall be performed before the procedure. Clinical information that increases the risk for complications should be extracted.

1. History of previous reaction to contrast media is at high risk of having another ACR, regardless of brand.

    a. A non-contrast study or another alternative imaging modality shall be recommended.
    b. If iodinated contrast media is deemed necessary, pre-medications should be prescribed. Pre-medications may decrease the frequency but not completely eliminate ACRs. The following regimen is recommended:

        i. Standard **oral** protocol
            - **Prednisone**, 0.5-0.7 mg/kg PO, 13, 7 and 1 hour/s prior to injection (50 mg max)
            - **Diphenhydramine**, 1.25 mg/kg PO, 1 hour prior to injection (50 mg max)

        ii. Intravenous protocol
            - Referral to the attending or requesting physician

2. Patients who have history of asthma have higher incidence of ACRs.

    a. If patients with asthma are on maintenance medications or if symptoms are only **mild and intermittent** (i.e. daytime symptoms $\leq$ 2x a week; nighttime symptoms $\leq$ 2x a month), pre-medications may not be necessary.

    b. For patients with **persistent** symptoms (i.e. daytime symptoms > 2x a week; nighttime symptoms > 2x a month), the above pre-medications are also recommended, if the contrast medium is deemed necessary.

3. Patient who have known allergy to food and other medications also have higher ACR incidence. Manifestation of symptoms should be elicited.

    a. For patients with **mild** reactions, (i.e. sneezing, nausea & vomiting, limited urticaria with transient pruritus, cough, warmth, pallor, nasal stuffiness, headache, flushing, dizziness, altered taste, sweats), pre-medications may not be necessary.

    b. For patients with following moderate and severe reactions, the above pre-medications are also recommended, if the contrast medium is deemed necessary

        i. **Moderate**: generalized urticaria or pronounced cutaneous reactions, wheezing, mild bronchospasm, laryngospasm, dyspnea, facial edema, vasovagal reaction, hypertension, hypotension, tachycardia, bradycardia

        ii. **Severe**: severe hypotension, anaphylactic shock, severe bronchospasm, laryngospasm, laryngeal edema, seizures, convulsions, loss of consciousness, unresponsiveness, arrhythmias, cardiopulmonary arrest

4. Renal protection from contrast-associated acute kidney injury (CA-AKI) is imperative.

    a. Serum creatinine determination should be required for all patients not more than 7 days from the day of the procedure.

    b. Along with the patient's height or length, the estimated Glomerular Filtration Rate (eGFR) expressed in mL/min/1.73 m^2 is computed using the Bedside Schwartz formula: **eGFR = 0.413 x [height in cm / serum creatinine]**

    c. Acceptable threshold for the eGFR should be < 45 mL/min/1.73 m^2.

    d. For patients with eGFR of **< 45 mL/min/1.73 m^2**, risk evaluation and reduction by a nephrologist or the attending / requesting physician is advised.

5. Patients with underlying thyroid disease (i.e. untreated or uncontrolled hyperthyroidism from Grave's disease or diffuse toxic goiter, differentiated follicular or papillary thyroid cancers with functioning remnants or metastasis), is at risk for thyrotoxicosis due to the iodine content of the contrast medium.

    a. Thyroid stimulating hormone (TSH) and free thyroxine (T4) levels should be determined prior to the procedure.

    b. Iodinated contrast media not only intravenous but also enteric routes should be avoided.

c. If contrast study is deemed necessary, prophylactic medications from the endocrinologist may be given.

d. Avoidance of thyroid radioisotope testing and radioactive iodine therapy for 4 weeks after iodinated contrast administration is recommended.

B. All patients who will undergo contrast procedures shall be observed prior, during and after the administration of the contrast media.

C. Iodinated contrast media may be administered at 1.2-1.5 ml/kg when using a dual-energy CT scanner. Otherwise, 2 ml/kg may be given.

D. Contrast administration using a power injector is very helpful and flow rates should be appropriate for the catheter gauge used. A 20-gauge or larger luminal caliber catheter is preferable for flow rates of ≥ 3 ml/sec. **24-gauge** angiocatheters in a peripheral location can be safely power injected using a maximum flow rate of approximately **1.5 mL/sec** and a maximum pressure of **150 psi**.

E. Contrast media warming to normal human body temperature (37°) is not necessary if injection rate is ≤ 5 ml/sec, or if iodine concentration of the contrast medium to be used is ≤ 320 mg I/kg.

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References:

ACR Manual on Contrast Media 2020

Davenport MS, et al. Use of Intravenous Iodinated Contrast Media in Patients with Kidney Disease: Consensus Statements from the American College of Radiology and the National Kidney Foundation. Radiology 2020; 294: 660-668

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