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REVIEW ARTICLE

Are Maxillofacial Radiologists Ready to get acquainted with Contrast Radiography: An Explicit Review

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ABSTRACT

In a conventional radiography, as a result of difference in attenuation of the x-rays, image is formed. Structures do not appear on radiograph which lack sufficient density. If the density of the structure is too low, or the contrast is too low, to meet the required diagnostic needs it can be improved artificially by using contrast media. To increase the density or contrast of the structure, contrast agents are boon in dentistry and they also block x-ray transmission thereby helps in better visualization of the structures. Artificial contrast can be produced in variety of ways.

This article enlightens the use of contrast radiography, agents, their uses as well as adverse effects and management.

Key words: Contrast radiography, contrast media, Density, Adverse effects.

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INTRODUCTION

The use of contrast agents aids significantly in the diagnostic procedures of radiological procedures. Internal structures can be visualized in a detailed manner which are not seen in a routine radiological procedure. With faster examination, excellent contrast enhancement and perfusion measurement, multi detector contrast enhanced computed tomography replaced many conventional diagnostic methods.¹

Contrast agents improve the visibility of internal bodily structures. When an agent enhances visibility of a particular area is enhanced by an agent called "contrast enhancing"¹

IDEAL REQUIREMENTS OF CONTRAST AGENTS:

- Contrast media should be radiopaque and should have a good contrast.
- The contrast agent and its metabolites should be non-toxic and have no harmful effect ie biological compatible
- The contrast agent should be excreted from the body in a short amount of time.
- The contrast agent should improve the visualization of the area of interest by increasing the CT attenuation

- The contrast media should have low surface tension.
- The contrast agent should be readily soluble or form stable suspensions at aqueous physiological conditions and should have low viscosity.¹

VARIOUS TYPES OF CONTRAST AGENTS

- Elements of higher atomic number (Z) are used as contrast agent molecule which can achieve levels of X-ray attenuation than observed for biological tissue. The atom of choice for contrast radiography was Iodine (Z = 53). The first water-soluble imaging agents were sodium and lithium iodide. But due to the associated toxicity of Iodine they were not considered suitable for most clinical applications.²
- “Ionic,” and “Non-ionic” molecules are two general categories of small-molecule iodinated contrast agents. “Ionic” iodinated imaging agents have higher tendency to interact with cellular structures and several disadvantages such as pain at the site of injection, renal toxicity, vasodilatation, pulmonary hypertension compared to “non-ionic” contrast media.³
- To overcome the problems associated with ionic CM, non-ionic iodinated contrast media are used. These non-ionic contrast agents have lower osmolality and exhibit lower adverse effects.⁴

CLASSIFICATION OF CONTRAST MEDIA (According to *E Whaires*)⁵

1. Barium sulphate suspension for investigation of GIT
2. Iodine-based aqueous solution:
 - a. Ionic monomers, eg. Iothalamate, metrizoate
 - b. Ionic dimer, eg. Ioxaglate
 - c. Non ionic monomers eg. iopamidol, iohexol, iopromide
3. Iodine based oil solutions eg. Ethiodol, pantopaque, lipidol

GENERAL PROPERTIES OF CONTRAST MEDIA

Route of administration

Intra-arterial contrast media has more side effects than intravenous contrast media. Contrast media when given intra-arterially due to higher acute intrarenal concentration are more nephrotoxic. More is the risk of CIN if the renal arteries are closer when injecting contrast medium.³

Venous Access Site

The favorable venous site is antecubital vein for intravenous contrast medium administration. A fast injection is necessary for fast scan but requires more accurate scan timing.⁶

APPLICATIONS OF CONTRAST MEDIA IN DENTISTRY

Contrast agents in sialography

Salivary glands are the soft tissue structures which are not seen radiographically. They are seen by the sialography which involves the use of retrograde filling of radiopaque contrast media. Contrast sialography can be performed by using lipid-soluble or water-soluble contrast agents.

a. Lipid soluble contrast media (iodized oils) which have iodine content 37 to 41%.

They are highly viscous, good radiographic opacification, sharp visualization, but they can cause discomfort to the patient as they tend to remain in the duct and can cause inflammatory reaction

b. Water soluble contrast media

They are greatly soluble with the body fluids and saliva, they have iodine content ranging from 28 to 30%. They are hypotonic solution with compare to plasma and saliva. They cause less pain and discomfort to the patient and they are rapidly removed from the tissues but they have less degree of radiographic contrast and density.⁵

Contrast media in arthrography

For the accurate visualization of synovial fluid and articular cartilage led to the introduction of the contrast media in joint space followed by x-ray examination, when used in TMJ it is known as “Temporomandibular joint arthrography”

It is used as single contrast arthrography and double contrast arthrography, in single contrast arthrography it is performed by using the contrast media in the lower compartment of the joint space only.

In double contrast arthrography both contrast media and air are introduced in both upper and lower compartments. It gives more information regarding the morphology of the joint.⁵

Contrast media in lymphangiography

To visualize the internal structure of the lymph nodes with the injection of contrast media into efferent lymphatics, Liodal and patent blue violet are commonly used in lymphangiography. It is usually injected subcutaneously transversely into the base of the toes.⁵

Contrast media in ultrasound imaging

Contrast media is also used in the ultrasound methods. In USG it is done to increase the back scatter echoes of the desired areas and contrast media are administered.⁵

Contrast media in magnetic resonance imaging

The use of contrast media is classified based on the basis of difference in the relation time after the injection.

Positive contrast agents are the compounds have small molecular weights containing manganese, and iron as active agents. They appear bright on MRI with increased signal intensity on T1 weighted images.

Negative contrast agents are the compounds which appear dark on MRI and are often termed as Super paramagnetic iron oxide (SPIO)⁵

ADVERSE REACTION OF CONTRAST MEDIA

Category of reaction

1. **Mild** (self-limited without evidence of progression) Symptoms include hives, rashes and sweats, nasal symptoms, nausea, vomiting pallor, cough, flushing, warmth, chills, headache and/or dizziness & self-limited anxiety.

2. **Moderate** (signs and symptoms are more pronounced) Symptoms include generalized or diffuse erythema, Tachycardia/ bradycardia, Bronchospasm, wheezing and/or dyspnea, Hypo- or hyper-tension & Voice hoarseness.

3. **Severe** (sign and symptoms are often life threatening) Symptoms include laryngeal edema which is severe or rapidly progressing, convulsions, profound hypotension, unresponsiveness, clinically manifest arrhythmias & cardiopulmonary arrest.^{7,8}

TREATMENT MODALITY FOR ADVERSE REACTION

If the patient is allergic to contrast media, steroids can be used, if the patient has received the steroid preparation once, then the patients need to continue to receive the steroid preparation. Greenberger protocol is used for the contrast adverse reaction. Prednisolone 50 mg orally 6h X 3 dose starting 13 h prior to scan: 13+ 7+1 h prior to scan is used.

REFERENCES

1. Hrvoje Lusic and Mark W. Grinstaf .X-Ray computed Tomography Contrast Agents Chem. Rev., 2013;113:1641–66.
2. Aspelin P. Eur. Radiol. Suppl. 2006;16: 22.
3. Jeffrey J. Pasternak and Eric E williamson. Clinical Pharmacology, Uses, and Adverse Reactions of Iodinated Contrast Agents: A Primer for the Non-radiologist. Mayo Clin Proc. 2012;87(4):390–02.
4. Katayama H. Yamaguchi K, Kozuka T, Takashima T, Seez P, Matsuura K. Adverse reactions to ionic and non ionic contrast media: a report from the Japanese committee on the safety of contrast media. Radiology. 1990;175(3):621
5. Andreucci M, Solomon R, Tasanarong A. Side effects of radiographic contrast media: pathogenesis, risk factors, and prevention. BioMed research international. 2014;2014.
6. Hunt CH, Hartman RP, Hesley GK. Frequency and severity of adverse effects of iodinated and gadolinium contrast materials: retrospective review of 456,930 doses. AJR Am J Roentgenol.2009;193:1124-27.
7. Prince MR, Zhang H, Zou Z, Staron RB, Brill PW. Incidence of immediate gadolinium contrast media reactions. AJR Am JRoentgenol. 2011;196:138-43.