3 Prevention of Acute Reactions

Judith A. W. Webb

CONTENTS
3.1 Introduction 11
3.2 Iodinated Contrast Media 11
3.2.1 Types and Frequency of Acute Reactions 11
3.2.2 Risk Factors for Acute Idiosyncratic Reactions 11
3.2.2.1 Type of Contrast Agent 11
3.2.2.2 Previous Contrast Medium Reaction 12
3.2.2.3 Asthma 12
3.2.2.4 Allergy 12
3.2.2.5 Drugs 12
3.2.3 Prevention of Acute Idiosyncratic Reactions 13
3.2.3.1 Choice of Contrast Medium 13
3.2.3.2 Premedication 13
3.2.3.3 Pretesting and Injection Rate 14
3.2.4 Summary: Iodinated Contrast Media 14
3.3 Gadolinium Contrast Media 15
3.3.1 Types of Reaction and Frequency 15
3.3.2 Risk Factors for Reactions 15
3.3.2.1 Type of Contrast Medium 15
3.3.2.2 Patient Risk Factors 15
3.3.3 Prevention of Reactions 15
3.3.4 Summary: Gadolinium Contrast Media 15
References 16

3.1 Introduction

Most of this chapter is concerned with acute idiosyncratic reactions to iodinated contrast media, particularly the factors predisposing to these reactions and the measures that may be taken to prevent them. At the end of the chapter acute reactions to gadolinium contrast media are also discussed.

3.2 Iodinated Contrast Media

3.2.1 Types and Frequency of Acute Reactions

Acute idiosyncratic systemic reactions (also described as allergy-like or anaphylactoid) are defined as unpredictable reactions which occur within 1 h of contrast medium administration, and which are unrelated to the amount of contrast medium above a certain level. This definition aims to distinguish them from chemotoxic reactions, which are dose-related and dependent on the physico-chemical properties of the contrast medium. However, in clinical practice, some reactions such as cardiovascular collapse may be difficult to characterise definitely into one or other group.

The mechanisms by which idiosyncratic reactions occur are not fully understood. However, they do appear to involve the release of active mediators, such as histamine, bradykinin, leucotrienes, prostaglandins and complement factors. Available evidence suggests that there are a variety of complex interactions between the complement, contact, coagulation and immune systems (Lasser 1985, 1987; Almen 1994).

Acute idiosyncratic reactions are usually characterised as mild, moderate or severe. Mild or minor reactions include nausea, mild vomiting, urticaria and itching. Moderate reactions include more severe vomiting, marked urticaria, bronchospasm, facial or laryngeal oedema, and vasovagal reactions. Severe reactions include hypotensive shock, respiratory arrest, cardiac arrest and convulsions (Bush and Swanson 1991).

3.2.2 Risk Factors for Acute Idiosyncratic Reactions

3.2.2.1 Type of Contrast Agent

With the older high osmolality ionic agents the rate of reactions of all types is in the range 5%–12% (Ansell...
et al. 1980; Witten et al. 1973; Shehadi 1975; Katayama et al. 1990; Cochran et al. 2001). The majority of reactions in these series were mild with moderate reactions occurring in 1%–2% and severe reactions in approximately 0.10%–0.15% (Ansell et al. 1980; Witten et al. 1973). Mortality with the ionic agents is in the range 1 in 14,000 to 1 in 169,000 (Shehadi 1975; Katayama et al. 1990) with 1 in 75,000 an often quoted figure (Hartman et al. 1982).

With the newer low osmolality nonionic agents, the reaction rates are lower, by a factor of approximately four to five times (Katayama et al. 1990; Palmer 1988; Wolf et al. 1991; Bettman et al. 1997). Thus in Katayama’s series of over 300,000 patients the reaction rates for ionic and nonionic agents were overall 12.66% and 3.13%, with severe reactions in 0.22% and 0.04%, respectively (Katayama et al. 1990). Based on a meta-analysis of all data published between 1980 and 1991, Caro et al. (1991) concluded that 80% of contrast media reactions could be prevented by using low osmolality agents. The very low mortality means that accurate mortality figures are not yet available for the nonionic agents. In Katayama et al.’s (1990) series there was no significant difference in mortality between the ionic and nonionic agents, but other data suggests a lower mortality with nonionic agents (Lasser et al. 1997).

3.2.2.2 Previous Contrast Medium Reaction

A previous reaction to an iodinated contrast medium is the most important patient factor predisposing to an acute idiosyncratic reaction (Bettman et al. 1997). With ionic agents, the risk of a reaction in a patient who reacted previously has been stated to be 16%–35% (Witten et al. 1973; Shehadi 1975) and to be eleven times greater than the risk in a non-reactor (Ansell et al. 1980). When a patient who previously reacted to an ionic agent is given a nonionic agent, the risk of a repeat reaction is reduced to approximately 5% (Siegle et al. 1991).

3.2.2.3 Asthma

Asthma is another important risk factor. Shehadi (1975) found that 11% of asthmatics had a reaction to ionic contrast media and Ansell et al. (1980) stated that the risk of reaction to ionic agents was increased five times in an asthmatic. In patients with asthma, Katayama et al. (1990) described an 8.5 times increased risk with ionic agents and a 5.8 times increased risk with nonionics. Other conditions, such as hayfever, eczema, etc. are associated with an increased risk of reaction, but by a lesser amount than asthma (Ansell et al. 1980; Witten et al. 1973; Shehadi 1975).

3.2.2.4 Allergy

A history of allergy to foods, drugs or other substances is associated with an increased risk of contrast medium reaction, usually by a lesser amount than a history of asthma. Thus, Shehadi (1975) and Katayama et al. (1990) found a two-fold increase in risk of a reaction and Ansell et al. (1980) a four times increase in risk of a reaction.

Allergy to foodstuffs which contain iodine, e.g., seafood, often causes particular anxiety. However, the available data suggests that allergy to seafood is no more significant than allergy to other foodstuffs (Witten et al. 1973; Shehadi 1975; Leder 1997).

Allergy to topical iodine skin preparations is a type of contact dermatitis and does not seem to predispose to acute idiosyncratic contrast medium reactions (Thomsen and Bush 1998).

3.2.2.5 Drugs

Whether or not β blockers affect the incidence of idiosyncratic contrast medium reactions is controversial. Greenberger et al. (1987) reported that neither β blockers nor calcium antagonists given separately or together increased the risk of reaction. Subsequently, however, Lang et al. (1991) found that β blockers did increase the risk of reaction. It is however agreed that the use of β blockers can impair the response to treatment if a reaction does occur (Thomsen and Bush 1998; Greenberger et al. 1987; Lang et al. 1991).

Patients who are receiving or have received interleukin-2 are at increased risk of adverse events following iodinated contrast media. Some of these adverse events appear to recall the side-effects of interleukin-2 (e.g., fever, nausea, vomiting, diarrhea, pruritus and rash) (Zukiwski et al. 1990; Fishman et al. 1991; Oldham et al. 1991; Choyke et al. 1992). Reactions are often late, occurring more than one hour after contrast medium, but can occur within the first hour (Choyke et al. 1992).