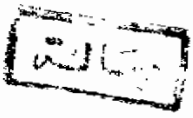
RADIOCONTRAST INDUCED IMPAIRMENT OF RENAL FUNCTION



THESIS

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PRESENTED BY

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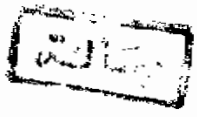

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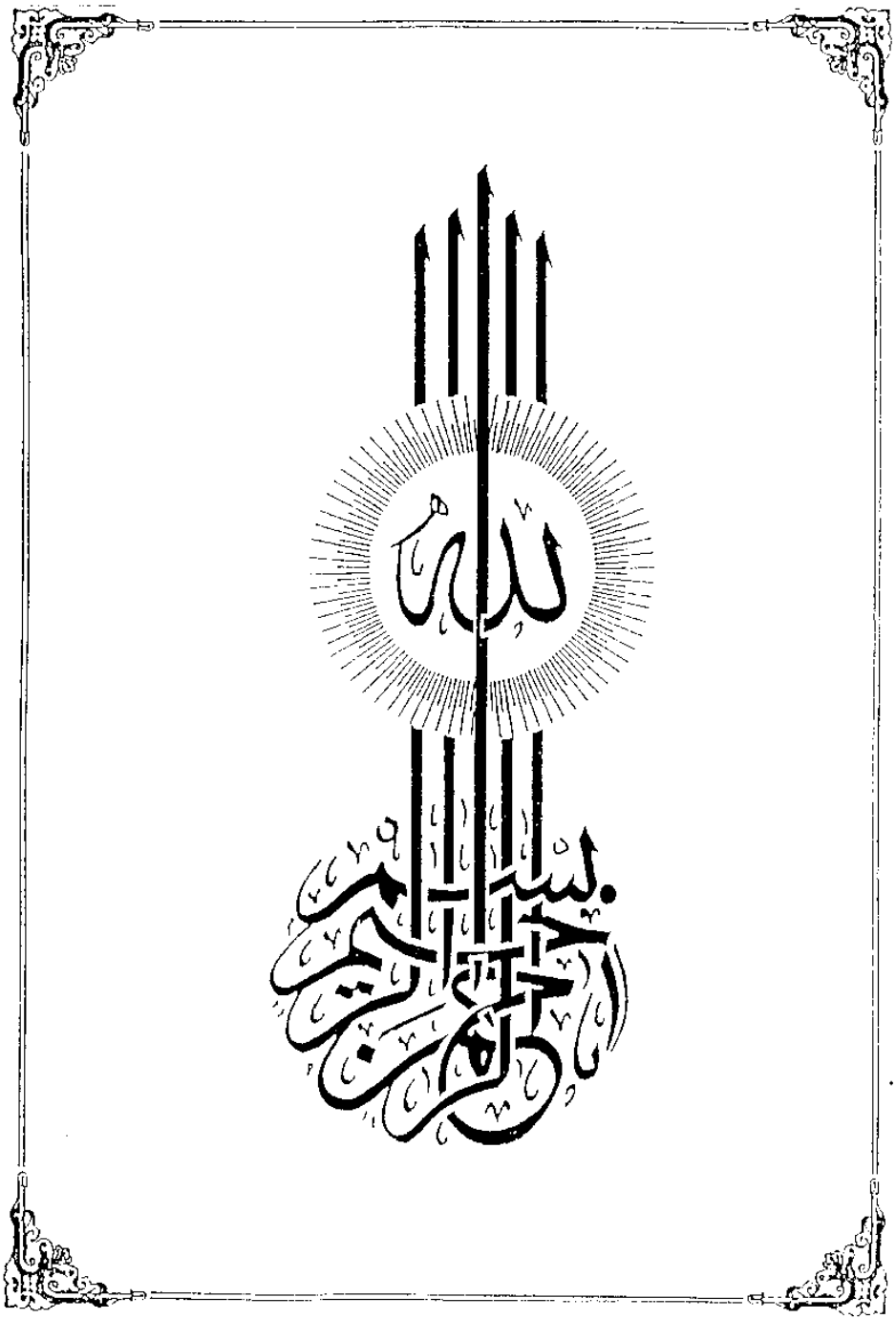

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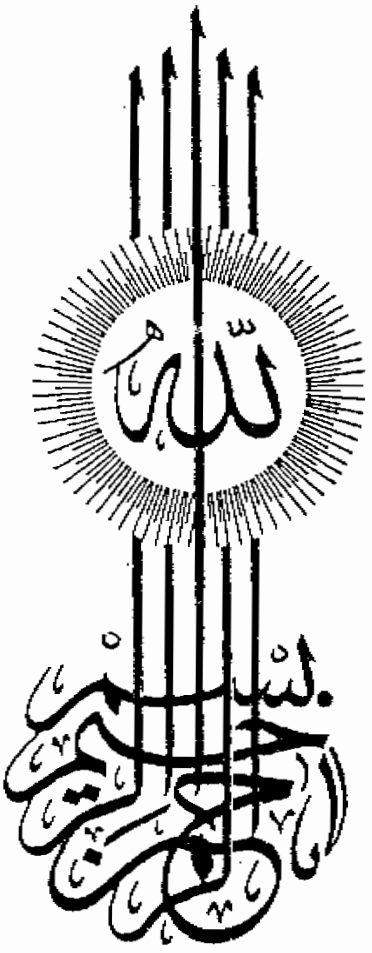

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Introduction & Aim Of The Work

INTRODUCTION

Contrast nepheropathy may be defined as an acute impairment of renal function that follows exposure to radiolgraphic contrast materials, and for which alternative etiologies for renal impairment have been excluded.

Acute renal insufficiency have been reported following exposure to radiologic contrast administered by oral, (Rene et al., 1959.), (Wennberg et al.,1963), (Canales et al.,1969), (Duggan et at.,1972.),intravenous, (Hanaway 1977), (Carvallo et al., 1978.),(Harkonen 1979), (Anto et al., 1981),& intra-arterial (Khan et al., 1972), (Kovnat et al., 1973), (Eisenberg et al., 1980), (Kumar et al., 1981).

Exposure to contrast media is the most common cause of hospital-acquired renal insufficiency & exceeds aminoglycosides as a cause of renal insufficiency (Hou 1983).

Beroniade & Hou et al., 1983 reported that 10% of all cases of acute renal failure are now caused by radiocontrast materials.

Considering only urography, eight millions contrast procedures are performed annually in the united states (Pfister et al., 1980).

Although large, this number represents only a fraction of the total contrast exposures, which include

cholecystography, cholangiography, venography, angiography & the increasingly enhanced computed tomography.

While the over-all incidence of contrast nephropathy is very low (D Elia et al., 1978), specific subgroups of patients have been identified in which the incidence has exceeded 90% of those exposed (Weinrauch et al., 1977).

Unless particularly susceptible individuals are identified & excluded from exposure, the number of patients affected by contrast nephropathy will increase with the increasing applications of contrast media in medicine.

This study reviews the literature and attempts to identify factors which place individual patients at particular risk.

Review Of Literature

HISTORICAL DEVELOPMENT OF CONTRASTS AND CONTRAST DOSE

Sodium iodide was first suggested as a contrast medium for roentgenography in 1918 (Cameron et al., 1981) and was administrated intravenously for the study of the urinary tract by (Osborne et al., 1923).

Sodium bromide and colloidal thorium dioxide contrast media were also used in the 1920s.

Thorium has since been associated with neoplastic toxicity, occurring up to 40 years after exposure (Silpananta et al., 1983).

Diiodinated compunds were developed in the 1930s and were not replaced by triiodinated compounds, acetrizoate, untill the 1950s (Saxton et al., 1967).

The current contrast media, diatrizoate and iothalamate, were introduced in the late 1950s and found to be more effective and less toxic.

From 1923 to 1963, radiographic contrast media were considered contraindicted for patients with renal insufficiency because it was thought that the associated impairment of renal concentration would not yield a suitable contrast study and that the contrast medium might further injure the already damaged kidneys (Grainger et al., 1972).

In 1963, high-dose pyelography, using up to 60 ml of 50% sodium diatrizoate, was reported to be safe & effective in opacifying the uninary tract of patients with renal insufficiency (Schwartz et al ., 1963).

A year later, the technique of drip infusion was introduced and the dose subsequently increased to 1 ml of contrast medium per pound of body weight, diluted equally with saline or distilled water (Schenker et al., 1964).

The success of these techniques essentially obviated retrograde pyelography in the evaluation of patients with chronic renal failure (Talner et al., 1972).

In spite of scattered reports of toxicity, particularly among dehydrated patients with diabetes, (Bergman et al., 1968), (Pillay et al ., 1970), (Dudzinsk, et al., 1971), (Barshay et al., 1973), high-dose contrast procedures were considered safe until the mid 1970s (Bishop et al., 1964), (Whitesel et al., 1964), (Bartleg et al ., 1969),(Danford et al., 1969),(Fry et al., 1971),(Fulton et al., 1969),(Voltz et al., 1971).

By the late 1970s, however, descriptions of the potential nephrotoxicity of contrast exposure were

accumulating in the literature (Diaz Buxio et al., 1975),(Ansari et al., 1976),(Appell et al., 1977),(Carvallo et al., 1978),(Krunlovsky et al., 1978), (Alexander et al., 1978),(Byrd et al., 1979).

PHARMACOLOGY OF CONTRAST MEDIA

The current angiographic & urographic contrast agents are 2,4,6 - tri-iodinated- Benzoic acid derivatives. All preprations are markedly hyperosmolar and have iodine contents between 26 & 37 percent.

The most popular parenteral agents are the sodium and meglumine salts of diatrizoate and iothalamate. Both salts are water soluble.

Because of low PH of carboxyl group, these weak organic acids exist as anions biologically, and therefore distributed only to the extracellular space. (Madge 1980).

Plasma proteins binding is insignificant (Schiantarelli et al., 1973).

These compounds are entirely excreted by the kidneys. The half life being 30-60 min in patients with normal renal functions.

Secondary routes of excretion in renal failure include liver & bile and small bowel mucosa and , in combined hepato renal insufficiency, tears and saliva (Talner, 1972).

Ipodate & iopanoic acid used in oral cholecystography are rapidly absorped after oral administration, excreted by the liver into bile, and concentrated in the gall bladder.

Glucuronide conjugates of these compounds are formed, and their final excretion is variably through