

Assessing the Effect of Radiological Contrast Media on the Renal Function and Inflammatory Markers in People with Type 2 Diabetes

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Background: Patients with diabetes are at increased risk of microvascular and macrovascular complications. Contrast media is routinely used in the assessment of lower limb macrovascular disease. It has been previously noted that pre-existing renal impairment can worsen with the use of contrast media¹. We aimed to retrospectively study the effect of contrast media used during radiological studies on renal function in patients with diabetes. In addition, it has also been reported that contrast media may have an effect on haemoglobin and inflammatory markers². We aimed to assess this in our patient population.

Methods: We identified 84 patients with diabetes who underwent radiographic imaging involving intravenous contrast at our institution during 2009-10. Using the hospitals electronic results system, we compared baseline renal function (using serum creatinine and eGFR as measures) to renal function at 24, 48 and 72 hours post-contrast exposure. We also looked at the effect of contrast on haemoglobin (Hb), white cell count (WCC) and its differential, and C-reactive protein (CRP). We used a student paired t-test to determine significance between groups.

Results: Of the 84 patients identified, 7 did not have any follow up bloods recorded. Of the remaining 77 patients, 9 did not have more than one blood sample taken. Of the 68 included in our study, none had an eGFR of <15mls/min (i.e. CKD5). Results are compiled on Tables 1 & 2.

CKD	N	Average Cr	+24 hours	+48 hours	+72 hours	P-value (0v72 hours)
1	13	103.92	-0.6%	0	-8.18%	0.227
2	21	71.19	-3.51%	-7.26%	-5.22%	0.088
3	27	44.96	4.06%	-8.9%	-12.01%	0.104
4	7	24.00	3.33%	-1.04%	-5.21%	0.647
TOTAL	68	61.02				0.0085*

Table 1. Effect of contrast on patients depending on baseline renal function. CKD1 = eGFR >90mls/min, CKD2 = 60-89mls/min, CKD3 = 30-59mls/min, CKD4 = 15-29mls/min. Results are recorded as percentage change from baseline. The p-value shown compares baseline to 72 hour renal function.

Parameter	Pre-Contrast	Total Change From Baseline		
		+24 hours	+48 hours	+72 hours
Haemoglobin (g/dL)	12.34	-0.208 (p=0.319)	-0.745 (p=0.007)*	-0.793 (p=0.0015)*
White Cell Count (x10 ⁹ /L)	9.38	0.086 (p=0.734)	-0.7 (p=0.160)	0.686 (p=0.243)
Neutrophils (x10 ⁹ /L)	6.51	0.190 (p=0.420)	-0.227 (p=0.614)	0.976 (p=0.091)
Lymphocytes (x10 ⁹ /L)	1.84	-0.153 (p=0.071)	-0.474 (p=0.003)*	-0.354 (p=0.008)*
C-Reactive Protein (mg/L)	53.39	-2.169 (p=0.666)	-3.214 (p=0.836)	-2.75 (p=0.817)

Table 2. Effect of IV contrast on Full Blood Count and Inflammatory Markers. Results shown are average change from baseline. * = statistically significant results. When sub-divided into stages of CKD, the only result of note was observed in lymphocytes in those with CKD1 – a significant difference was observed at 72 hours.

Discussion:

From our analysis we observed:

1. There was no significant change in total WCC, neutrophil count or CRP
 2. Haemoglobin level pre-contrast did not appear to be related to renal function
 3. Lymphocyte count was significantly decreased after both 48 and 72 hours
 4. Renal function in the population as a whole significantly deteriorated, however the reduction was not observed to significance within individual stages of CKD
5. 28 (33%) of the 84 patients selected had died within 3 years of undergoing angiography

There were however limitations of this study. Firstly, not all of the patients had bloods pre- and post-study, which reduced the sample size. Secondly, using only our electronic biochemistry system we were unable to determine if metformin had been stopped pre-study and in addition, we were unable to determine how much IV fluid was given post-study.

Conclusion: Despite IV fluids being given pre- and post-contrast media administration, an overall significant negative effect on renal function is observed at 72 hours. The key point appears to be between 24 and 48 hours when IV fluids are likely to stop. A fall in haemoglobin is also observed – the administration of IV fluids may explain this. Although WCC does not fall, the proportion of lymphocytes does, which may suggest an effect of the contrast media on lymphocyte production. Of note is that a third of the patients sampled had died within 3 years of requiring an angiogram – probably a reflection of poor general health before the study.

References:

¹Tepel M, Aspelin P, Lameire N. Contrast-induced nephropathy: a clinical and evidence-based approach. *Circulation*. 2006; 113: 1799–1806

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