

Timing of contrast enhanced radiological procedures and risk of AKI in post-operative patients

Samira Bell^{1,2}, Huan Wang², Peter Donnan², Ian Zealley³

¹Renal Unit, Ninewells Hospital, Dundee, ²Population Health Sciences Division, University of Dundee, Dundee, ³Department of Radiology, Ninewells Hospital, Dundee, UK.

Introduction

Iodinated contrast media used in angiography and computed tomography (CT) scans is an important cause of AKI in hospitalized patients undergoing surgery. Contrast induced nephropathy leads to AKI soon after contrast media administration.

Aims

The aim of the study was to determine whether the timing of contrast media exposure related to diagnostic imaging during the immediate peri-operative period influences the risk of post-operative AKI.

Methods

- All patients aged 18 or over who underwent diagnostic imaging within 7 days of surgery in the Tayside region of Scotland, UK were included in the analysis.
- Data were linked between the following datasets: Scottish Morbidity Record of hospital admissions, laboratory results, dispensed prescribing from community pharmacies, computerised radiology information system, the Scottish Renal Registry and the General Register of Deaths.
- The primary outcome of AKI was defined using the KDIGO creatinine based criteria.
- Multivariable logistic regression was performed to identify predictors for AKI.

Results: Baseline Demographics

	AKI (n=682, 11%)	No AKI (n=5,522)	Overall (n=6,204)
Age (years)	74 (63 - 81)	67 (54 - 77)	68 (55 - 78)
Sex (M:F)	373 (55%)	2,749 (50%)	3,122 (50%)
Diabetes	151 (22%)	801 (15%)	952 (15%)
No. on ACE inhibitors or ARBs	253 (37%)	1,277 (23%)	1,530 (25%)
eGFR category (eGFR mL/min):			
<29	104 (15%)	226 (4%)	330 (5%)
30-44	115 (17%)	382 (7%)	497 (8%)
45-59	122 (18%)	683 (12%)	805 (13%)
>60	341 (50%)	4,231 (77%)	4,572 (74%)
Deprivation score (Scottish SIMD5):			
1 (most deprived)	126 (18%)	1,155 (21%)	1,281 (21%)
2	114 (17%)	987 (18%)	1,101 (18%)
3	106 (16%)	946 (17%)	1,052 (17%)
4	208 (30%)	1,482 (27%)	1,690 (27%)
5 (least deprived)	121 (18%)	857 (16%)	978 (16%)
Missing	7 (1%)	95 (2%)	102 (2%)
Timing of CM:			
<24 hours	428 (63%)	3,355 (61%)	3,783 (61%)
24 - 48 hours	78 (11%)	548 (10%)	626 (10%)
48 - 72 hours	38 (6%)	402 (7%)	440 (7%)
>72 hours	138 (20%)	1,217 (22%)	1,355 (22%)
Number of medicines:			
0	41 (6%)	596 (11%)	637 (10%)
1 - 5	138 (20%)	1,475 (27%)	1,613 (26%)
6 - 11	161 (24%)	1,124 (20%)	1,285 (21%)
11 - 15	110 (16%)	852 (15%)	962 (16%)
16 - 20	86 (13%)	563 (10%)	649 (10%)
>20	146 (21%)	912 (17%)	1,058 (17%)

Results (continued)

- 9151 patients underwent CT scanning within 7 days of surgery between 1st of January 2003 and 31st of December 2013
- Of these 6204 were exposed to contrast media.
- Post-operative AKI occurred in 682 (11%)
- Of these 598 were Stage 1, 90 stage 2 and 44 Stage 3.
- None of the variables were associated severity of post-operative AKI.
- The risk difference and risk ratio shown both suggest no causal relationship between CM exposure and post-operative AKI.

Risk of AKI with CM

	Non-exposed to CM	Exposed to CM	Total
No post-operative AKI	2,610	5,522	8,132
Post-operative AKI	337	682	1,019
Total	2,947	6,204	9,151
Relative risk	0.114	0.110	0.111

	Estimate	95% CI
Risk difference (Exposed - Non-exposed)	-0.004	(-0.018, 0.010)
Risk ratio (Exposed / Non-exposed)	0.961	(0.843, 1.096)

Predictive Variables

	Multivariate OR (95% CI)	p value
Age (years)	1.013 (1.007 - 1.020)	< 0.001
Male gender	1.312 (1.111 - 1.548)	0.001
Diabetes	1.253 (1.012 - 1.551)	0.038
ACE inhibitors or ARBs	1.345 (1.114 - 1.625)	0.002
eGFR Category (mL/min):		
<29 (reference)	--	--
30-44	0.635 (0.463 - 0.872)	0.005
45-59	0.393 (0.290 - 0.534)	< 0.001
>60	0.225 (0.171 - 0.294)	< 0.001
SIMD5	1.046 (0.985 - 1.111)	0.145
Number of prescriptions		
0 (Reference)	--	--
1-5 vs 0	1.141 (0.781 - 1.652)	0.484
6-11 vs 0	1.316 (0.902 - 1.918)	0.154
11-15 vs 0	1.088 (0.731 - 1.621)	0.677
16-20 vs 0	1.159 (0.763 - 1.760)	0.489
>20 vs 0	1.205 (0.812 - 1.788)	0.355
Days of CM exposure before surgery*	1.024 (0.985 - 1.064)	0.234

Conclusion

Shorter intervals between contrast media exposure and surgery were not associated with a statistically significant increase in the risk of post-operative AKI. However male gender, baseline renal function, presence of diabetes and treatment with ACE inhibitors or ARBs were predictors of post-operative AKI. For patients who have either just had or are soon to undergo general surgical procedures there appears to be no need to compromise CT scan quality by avoiding the administration of contrast media. These patients may benefit from the increased diagnostic utility of contrast-enhanced CT scans without increasing their risk of perioperative AKI.

Since the abstract was submitted a misallocation was identified in the original analysis. Consequently the results presented in this poster differ slightly from those in the abstract and represent the most accurate analysis achievable.