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The rate of instrument breakage during orthopaedic procedures

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Abstract The current study investigates instrument breakages during both emergency and elective orthopaedic surgery. Over a 2 year period a total of 7,775 procedures were performed. We found that 14 instruments were broken during 12 operative cases. Drill bits accounted for the largest proportion of breakages (11/14), and a specialist registrar was the lead surgeon in the majority (8/12) of cases. Only one case had a consultant as the lead surgeon. In seven cases the broken bit of the surgical instrument was left in the patient. Documentation of this peri-operative complication was deficient, and the patient was often not informed.

Résumé Cette étude enquête sur les ruptures d'instrument pendant les opérations de chirurgie orthopédique urgentes ou programmées. Sur une période de deux années un total de 7775 interventions a été exécuté. Nous avons noté que 14 instruments ont été cassés pendant 12 opérations. Les éléments de la perceuse comptent la plus grande proportion de ruptures (11/14) et un chirurgien confirmé était le chef d'équipe dans la majorité (8/12) de cas. Dans 7 cas le morceau cassé de l'instrument a été laissé dans le malade. La documentation de cette complication opératoire était défectueuse et souvent le malade n'était pas informé.

Introduction

Surgical instrument breakage has been reported sporadically in the literature [3, 4, 7]. By contrast, the popular press have reported on legal proceedings following such problems ("woman sues over drill bit left in foot" [5]). The attention of the clinical governance committees will doubtless soon follow this trend, and a better evidence base will be required. Currently, there is no published data concerning the rate of instrument breakage during standard orthopaedic operations. Furthermore, there are no recommendations regarding documentation of such incidents. The aims of this work were to: (1) Determine the rate of instrument breakage during orthopaedic surgery at our district general hospital; (2) outline the circumstances during which instrument breakage occurred; (3) elucidate the action taken after the event; and (4) establish protocols that should be followed in the event of such a complication occurring.

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Methods

We studied procedures undertaken in the operating theatre at our hospital during the 24-month period 1 January 1998–31December 1999.The total number of procedures undertaken was derived from a computer database. Previous published work has shown this database to be highly complete and accurate [6]. All incident forms in the theatre logbook relating to the study period were also reviewed. Hospital notes (which included a handwritten surgical note and a typed operative note) and radiographs were obtained of all patients for whom orthopaedic instrument breakage was documented.

The following data was recorded from each set of patient's case notes: age, sex, presence of a primary bone pathology, surgical procedure, type of instrument broken, action taken, documentation, timing of operation and grade of lead surgeon. The postoperative radiographs were reviewed in all cases for evidence of incomplete or broken metalwork. Mean follow-up period was 36 (12–47) months.

Results

Rate of instrument breakage

During the 24-month study period 7,775 orthopaedic procedures were undertaken. This consisted of 1,521 trauma and 6,254 elective cases. Fourteen instrument

Table 1 The 12 cases in which instrument breakage occurred

Patient number	Age	Sex	Surgical procedure	Type of instrument broken	Left in situ or removed	Documentation	Timing of operation	Grade of surgeon
1	15	M	ORIF distal humerus	Drill bit	Left in situ	Dictated note only	Night	SpR
2	22	F	IM nail femur and ORIF tibial plateau	Drill bit	Left in situ	Dictated note only	Day	SpR
3	23	M	Bone grafting – fibula	Drill bit	Removed	None	Day	SpR
4	25	M	ORIF distal humerus	Drill bit × 2	Left in situ	Post-op. only	Day	Locum
5	28	F	A/O screws – hip	Guide wire	Left in situ	All notes including post-op.	Day	SpR
6	72	M	Revision THR	Wire cutters	Removed	None	Day	Cons.
7	76	M	ORIF femur	Drill bit	Left in situ	Dictated note only	Day	SpR
8	85	F	DHS	Drill bit	Removed	None	Night	Locum
9	88	F	DCS to distal femur	Drill bit × 2	Left in situ	Dictated note only	Day	SpR
10	16	M	IM nail tibia	Drill bit	Left in situ	All notes including post-op.	Day	SpR
11	26	M	IM nail tibia	Drill bit	Removed	None	Day	SpR
12	90	M	DHS	Screw	Removed	None	Day	Locum

Table 2 Certain operations and grades of surgeon were associated with higher risk of instrument breakage

Procedure	Grade of surgeon	Number of cases performed	Number of instruments fractured	Fracture rate (Percentage)
IM nail – femur	Cons.	10	0	0.0
	Reg.	12	1	8.3
IM nail – tibia	Cons.	16	0	0.0
	Reg.	32	2	6.4
ORIF hip (DHS and A/O screws)	Cons.	20	0	0.0
	Reg.	127	3	2.4
ORIF distal humeral fracture	Cons.	4	0	0.0
	Reg.	3	3	100.0
ORIF femur	Cons.	15	0	0.0
	Reg.	22	3	13.6

breakages were documented in 12 surgical cases. The recorded rate of breakage was therefore 0.18% overall (1.8 instruments per 1,000 cases).

Circumstances of instrument breakage

The average age of patients was 47 (15–90) years. There were eight males and four females. Twelve of the 14 breakages occurred during trauma operations, and all but two occurred during daytime scheduled lists (elective or trauma). Details of the 12 cases in which breakage occurred are documented in Table 1. Certain operations and surgeon grades were associated with higher risk of breakage (Table 2).

Action taken

Regarding documentation, all patients had both a handwritten and a typed operation note completed by the surgeon. An instrument fracture was recorded in only two of the handwritten notes whereas six were recorded in the typed notes. There were no significant differences with regards to surgeon grade and completeness of this documentation. Of the seven patients who left theatre with retained broken metalwork, only three had documentation that they were informed postoperatively. None of the patients returned after discharge with complications resulting from broken metalwork.

Discussion

Our overall documented instrument breakage rate was 0.18%. Our study was retrospective and involved a broad range of cases and surgeon grades. This rate is similar to that documented in studies concerning specific procedures [1, 2].

There was a marked variation in the breakage rate between elective and trauma work – 0.03% (0.3 per 1,000 cases) versus 0.79% (7.9 cases per 1,000) respectively. One trauma procedure associated with high breakage rates was internal fixation of distal humeral fractures. This is likely to be because of the necessity to drill cortical bone at an incident angle, thereby leading to drill bit bending and subsequent breakage. Fig. 1 illustrates such a case.

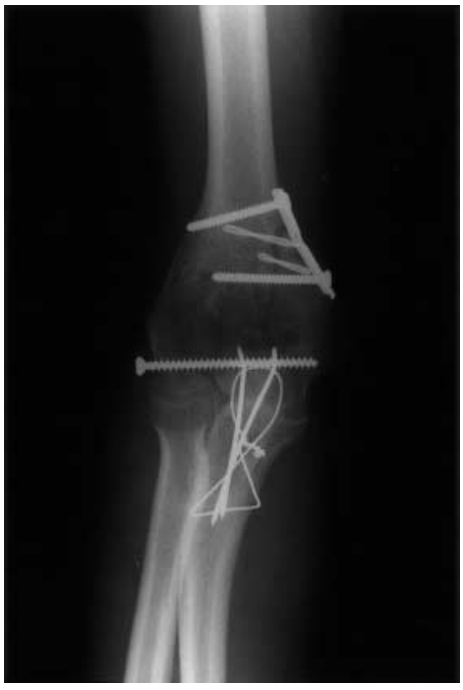

Fig. 1 Open reduction, internal fixation of a distal humerus fracture in which two drill bits were broken and left in situ

The most common instrument broken was a drill bit. One possible explanation for this is that in our institution all drill bits are re-used. It is likely that these drill bits are at increased risk of failure. We plan a follow-up study looking at the effects of wear on drill bit failure strength.

None of the patients reported ill effects from bits of metalwork being left in situ during the follow-up period.

Instrument breakage is a rare occurrence during orthopaedic surgical procedures and, if it occurs, the risk of harm to the patient is negligible. This study has highlighted that problems exist in the documentation of these events and the process of informing patients. We make the following recommendations:

1. All operative instrument breakages should be recorded in the incident logbook in the theatre suite by the operating surgeon.
2. All breakages ought to be recorded in the patient's case notes, especially where a piece of broken metalwork remains in the patient.
3. The patient should be notified about the incident and reassured that ill effects are unlikely. This discussion should be documented in the patient's case notes.
4. All instrument breakages should be reported to the local representative of the medical devices agency.

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