Performance and learning curve of a surgical care practitioner in completing hip aspirations

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ABSTRACT

INTRODUCTION The roles of non-medically trained practitioners within the NHS are expanding; they are now being employed by many specialties, including surgery, to relieve pressures on healthcare teams.

AIMS To investigate the learning curve and competence of an orthopaedic surgical care practitioner (SCP) in performing hip aspirations.

METHODS Data were retrospectively collected on 510 orthopaedic hip aspirations, of which 360 were completed by a single SCP and 150 were completed by surgeons before the SCP took over routine aspiration. The 360 aspirations completed by an SCP were separated into groups of 30 by date, so any trend in failure rate could be analysed. Ordinal χ^2 analysis was used to analyse this trend and Pearson χ^2 analysis was used to analyse differences in failure rates between professionals.

RESULTS The hip aspiration failure rate for the SCP was significantly lower than for the surgeons; 8.6% vs 20.7% ($P < 0.001$). With the experience gained in completing the first 210 procedures, the failure rate of the SCP dropped to 3.3% for the remaining 150 procedures. This downward trend in hip aspiration failure rate, with advancing experience of the SCP, was shown to be statistically significant ($P = 0.006$).

DISCUSSION SCPs who complete hip aspirations on a regular basis have significantly lower failure rates than surgeons, probably as a result of the learning curve, which this study demonstrated. Other trusts should consider delegating routine hip aspiration work to a designated SCP to lower failure rates.

KEYWORDS

Orthopaedics – Arthrocentesis – Operating room technicians – Efficiency

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Introduction

Over the past few decades, increasing numbers of new positions have been created within the NHS, allowing non-medical practitioners to undertake procedures and roles that were previously only undertaken by medically trained staff. In the field of surgery, such practitioners provide a valuable addition to the workforce, aiding in simple procedures and allowing surgeons to focus on more complex clinical problems.¹ With increasing pressures on the delivery of surgical services and the reduced number of working hours for doctors in training, the use of these expert practitioners has become vital.²

Although the use of expert practitioners in the perioperative setting is well established,³ it was not until 2006 that a formal curriculum for surgical care practitioners (SCP) was released.⁴ Since then, the curriculum has developed and the role of SCP has expanded, with the ability to perform joint aspiration now listed in the latest curriculum.⁵

In the setting of orthopaedic surgery, hip aspirations are reliable in diagnosing periprosthetic infection and should

also be performed in any joint where infection is suspected, as well to rule out infection before revision surgery.⁶ Typically, hip aspirations in orthopaedics have been completed by surgical registrars or consultants. In Northumbria Healthcare Trust, however, the majority of hip aspirations are now completed by a single SCP, who runs regular theatre lists dedicated to joint aspirations.

Despite the expanding role of perioperative practitioners, there is a lack of primary research investigating the level of competence and safety of SCPs in performing specific procedures.⁷ What little research there is concludes that non-medical practitioners are safe and effective in performing minor surgical procedures such as varicose vein surgery, excision of lipomas and sebaceous cyst removal.^{8,9}

This study investigated whether an SCP, as part of an orthopaedic surgical team, is able to perform hip aspirations to a satisfactory level. It also looks at the learning curve for hip aspirations to assess whether having a single practitioner performing the majority of aspirations within a trust may be beneficial.

Methods

All patients included in the study underwent a hip aspiration in one of three centres (Wansbeck General Hospital, North Tyneside General Hospital or Hexham General Hospital) between December 2010 and December 2015. The hip aspirations completed between December 2010 and June 2012 were performed by various surgical registrars and consultants, after which a single SCP took over routine hip aspiration work and completed all aspirations between July 2012 and December 2015 across all three hospital sites.

The aspirations were performed in the setting of trauma and orthopaedics and were done to investigate possible periprosthetic joint infections; either a clinically septic joint, in eliciting the cause of pain or prosthetic loosening prior to arthroplasty revision. Data were retrospectively collected from electronic records, including the date, the hospital in which the aspiration was done, who performed the procedure and whether it was successful. A failed aspiration was classified as an aspiration which was initially dry; most of these failed aspirations led to injection of saline and reaspiration, as is standard procedure.

The data relating to the SCP were analysed to identify whether there was a significant trend in the rate of failed aspiration with increasing experience and therefore to evaluate whether a learning curve exists for performing joint aspirations. To do this, the data were separated into groups of 30 aspirations, by date, and the number of failed aspirations plotted. The failure rate of the SCP was then compared with the failure rate of the surgeons who completed the hip aspirations prior to July 2012, to make an assessment of the ability of the SCP.

Statistical analysis

Statistical analysis was done using the program SPSS (IBM, New York, US). Ordinal χ^2 analysis using a linear-by-linear model was used to evaluate the statistical significance of apparent trends in failure rate. Pearson χ^2 analysis was used to identify any differences in failure rates between the surgeons and the SCP, surgical registrars and consultants and the different hospitals in which the hip aspirations were performed. An alpha level of 0.05 was selected; $P \leq 0.05$ was classified as statistically significant.

Results

In total, data were collected on 510 hip aspirations completed between December 2010 and December 2015. The SCP completed 360 of these aspirations between July 2012 and December 2015. The 150 aspirations completed in the time period prior to the SCP taking over routine aspiration work (December 2010 to June 2012), were completed by surgical registrars and consultants.

Of the 510 total hip aspirations completed, 294 (57.6%) were at Wansbeck General Hospital, 128 (25.1%) were at North Tyneside General Hospital and 88 (17.3%) were at Hexham General Hospital. Pearson χ^2 analysis showed that there was no significant difference in aspiration failure rate between the three locations ($P=0.139$).

Hip aspirations completed by the SCP

Of a total of 360 hip aspirations completed by the SCP, 31 (8.6%) failed. A display of how this failure rate changed with advancing experience can be seen in Fig 1, which shows that as the SCP gained experience, his failure rate decreased. Ordinal χ^2 analysis confirmed that this downward trend in failed aspirations with advancing experience was statistically significant ($P=0.006$). Further analysis revealed that the failure rate for hip aspirations was 12.4% over the first 210 procedures, which dropped to 3.3% for the remaining 150 procedures, when the practitioner had gained experience. A breakdown of the cumulative failure rate with advancing experience can be found in Table 1.

SCP compared with surgeons

Of the 150 hip aspirations performed by surgeons, 31 failed (20.7%). This failure rate of 20.7% was shown to be significantly higher than the failure rate of 8.6% achieved by the SCP, when χ^2 analysis was applied ($P<0.001$). A comparison of the failure rates can be found in Fig 2. Of the 150 hip aspirations completed by surgeons, 108 (72.0%) were completed by registrars and 42 (28.0%) by consultants. These 42 aspirations were completed by one of three different consultants. One of these consultants completed 28 aspirations, one completed 8 and the final consultant completed 6 aspirations. Overall, consultants had a failure rate of 26.2% and registrars had a failure rate of 18.5%, although this difference was not statistically significant ($P = 0.297$).

Discussion

This study showed two main statistically significant findings: the lower aspiration failure rate of a SCP compared with that of surgeons ($P<0.001$) and the learning curve demonstrated for hip aspirations ($P=0.006$). The SCP in this study, who has performed all the routine hip aspiration work in Northumbria Healthcare Trust since July 2012, achieved a failure rate of 8.6%, compared with 20.7% in the surgeons who

Table 1 Cumulative failure rate for hip aspirations performed by a single SCP; changes with experience

Hip aspirations completed (n)	Cumulative failure rate (%)
30	16.7
60	11.7
90	11.1
120	12.5
150	13.3
180	13.3
210	12.4
240	10.8
270	10
300	10
330	9.4
360	8.6

Figure 2 Comparison of percentage failure rate of hip aspirations for surgeons and an SCP, including overall failure rate and the failure rate of the experienced surgical care practitioner (SCP) after completion of 210 procedures

preceded him. A different study looking at joint aspirations in the setting of joint replacement reported a failure rate of 32%, which was worse than both the SCP and the surgeons in our study.¹⁰ Examination of the learning curve revealed that there was a large drop in the failure rate after performing around 210 procedures, with the first 210 procedures performed by the SCP incurring a failure rate of 12.4%, compared with 3.3% for the remaining 150 procedures.

The reason for the difference in failure rates between the SCP and the surgeons is almost certainly a result of the advanced experience of the SCP, who performed multiple aspirations on a weekly theatre list dedicated to joint

aspiration. As with any procedure, a healthcare professional who completes hip aspirations on a regular basis will gain expertise and have better results. This is backed up by the statistically significant learning curve which we have demonstrated. When the aspirations were completed by surgeons, most of the work was completed by registrars, who rotate frequently and would never perform sufficient aspirations to reach the top of this learning curve. The consultants only completed between 6 and 28 aspirations over the entire 19-month period for which we collected data, so they are not completing aspiration work on a regular basis, which is perhaps the reason for them having an even higher failure rate than the registrars (26.2% versus 18.5%), although this was not statistically significant ($P=0.297$).

Other papers report that the use of SCPs has led to reduced follow-up clinic workload in general surgery,¹¹ a decrease in patient waiting times in carpal tunnel surgery,¹² the ability to perform paediatric surgery at medium-sized district hospitals, enabling patients to be seen locally,¹³ and anecdotal reports of enhanced patient experience.¹⁴ These papers demonstrate the increased efficiency that an SCP adds to a surgical team. Our study builds on this by showing that an SCP can perform a specific procedure, in this case hip aspirations, with a high level of skill.

It is important to note that a proportion of hip aspirations, especially in the emergency setting, will still need to be completed by registrars. It is therefore important to ensure that registrars still receive adequate training. Having an SCP who completes all the routine aspiration work will be an invaluable tool in training registrars, as the SCP can pass on the knowledge gained from their high level of experience.

The main limitation of the study is the fact that we only looked at a single SCP, who may happen to be naturally talented in terms of his failure rate. However, this is very unlikely, given the level of statistical significance associated with the difference in failure rates. Although looking at a single practitioner allowed us to look at his learning curve effectively, a larger study across multiple trusts would allow for a better comparison of the failure rates between SCPs and surgeons.

Conclusion

In conclusion, this study provides good evidence that hip aspirations performed by non-medically trained SCPs on a regular basis have significantly lower failure rates than hip aspirations completed by surgeons (the current standard practice in the UK is for surgeons to perform this procedure). This can be explained, and supported by the significant learning curve demonstrated in this study. Other trusts should consider delegating their routine hip aspiration work to a designated SCP, to lower failure rates and allow medically trained staff to focus on complex clinical scenarios.

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