Competence in using the arthroscopy stack system: a national survey of orthopaedic trainees in the UK

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ABSTRACT

INTRODUCTION Surgeons are required to have a sound knowledge regarding all operating theatre equipment they wish to use. This is important to ensure patient safety and theatre efficiency. Arthroscopy forms a significant part of all orthopaedic subspecialty practice. Proficiency in performing arthroscopic procedures is assessed during registrar training. The aim of this survey was to determine the competence of orthopaedic trainee registrars in setting up the arthroscopy stack system and managing intraoperative problems.

MATERIALS AND METHODS Electronic survey forms were sent to all orthopaedic training programme directors in the UK to be forwarded to trainees in their deanery. The electronic survey contained 13 questions aimed at determining trainee experience and competence level with working with the arthroscopy stack system.

RESULTS A total of 138 responses were received from 14 deaneries in the UK. Almost all registrars had experienced intraoperative delays because of equipment malfunction that required addressing by more competent staff. However, 82% of respondents had not received any formal training for operating the arthroscopy stack system. Some 82% of registrars of ST7 grade or above, who had performed over 50 arthroscopic procedures and achieved a level 4 PBA competence, were unable to set up the stack system and successfully address these delays.

CONCLUSIONS Inadequate training is delivered to orthopaedic registrars from both the training programme and arthroscopy-themed courses with regards to set-up and operation of the arthroscopy tower system. This training should be part of the curriculum to ensure patient safety and efficient theatre practice.

KEYWORDS

Arthroscopy stack system – Orthopaedic training programme – Survey – Competence

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Introduction

Arthroscopic surgery is one of the greatest orthopaedic advancements in the 20th century.¹ The designs of modern arthroscopic systems are based on work by Watanabe and Takagi.² Initial problems with the system included the internal light source short-circuiting and sometimes shattering within the joint. In current practice, knee arthroscopy is widely accepted to be a safe procedure with an absolute risk of complications at 1.1%.³ As such, arthroscopic skills are an essential part of the orthopaedic surgeon's armamentarium, and the use of arthroscopy is inescapable, regardless of subspecialty choice.⁴

In the UK, orthopaedic specialty training typically spans six years, during which time arthroscopic skills have to be acquired and fine-tuned. The Joint Committee on Surgical Training (JCST) has certification guidelines for trauma and orthopaedic surgery.⁵ These guidelines state that trainees must have performed at least 40 arthroscopic procedures and have acquired a level-4 competence determined on procedure-based assessments (PBA). The number of

procedure is evidenced on the e-logbook website and recorded on the Intercollegiate Surgical Curriculum Programme (ISCP) website.^{6,7} Arthroscopic proficiency is also commonly gained by cadaveric and simulation training on various courses.⁸

PBAs assess a trainee's surgical skill in performing the arthroscopic procedure. In addition, the ability to arrange and deploy supporting specialist equipment and the ability to deal calmly and effectively with untoward events or complications are assessed. Furthermore, to achieve a level-4b grade, the trainee has to be able to anticipate, avoid and deal with common problems and complications. With regards to arthroscopic procedures, the specialist equipment required includes the arthroscopy stack/tower system (Fig 1).

It is certainly important to be aware of the potential complications encountered with performing arthroscopy on a patient. However, trainees should also be expected to be aware of the different parts of the stack, to set up the system and deal with basic intraoperative problems that could be faced.⁹ Some of the commonly encountered problems

with arthroscopy stacks are failure of light, fluid pump and blockages. These problems can lead to intraoperative delays, especially if the operating surgeon does not know how to address them.

For practical purposes and for purpose of the FRCS examination, orthopaedic trainees are expected to be aware of any instruments they use to operate on a patient and any materials they implant into a patient. These include the laminar flow operating theatres, diathermy system, tourniquets, polymethyl methacrylate bone cement and even theatre clogs. Ultimately, the operating surgeon is responsible for patient safety and the efficient function of the operating theatre service. A lack of competence in the setup and use of the arthroscopy stack system compromises both. There have been publications in the literature around the difficulty of training residents on performing an arthroscopic procedure and the learning curve associated with three-dimensional hand movements despite two-dimensional image visualisation.¹⁰ However, we were unable to identify any literature on training or assessment of surgeons on setting up the arthroscopy stacks. The aim of this study was to determine the competence of the

orthopaedic trainee registrar in the setup of the arthroscopy stack system and the management of any basic system failures.

Materials and methods

An electronic survey form (Box 1) was disseminated to all orthopaedic training programme directors in the UK in September 2018. The programme directors were requested to forward the survey to their trainees. Most of the responses we received were between September 2018 and January 2019, with a single response in May 2019. The survey contained 13 questions aimed at determining the experience level of trainees in performing arthroscopic surgeries and their competence level in dealing with stack setup, together with the ability to troubleshoot intraoperative equipment malfunctions. We were also interested in trainees' opinions about formal training in arthroscopy stack usage.

Results

Training programme directors in all 23 UK deaneries were electronically mailed. The survey was completed by 138 orthopaedic registrars from 14 deaneries (60%). Figure 2 shows the percentage of respondents by training grade. If we consider the total number of trainees who responded, 42% of registrars had undertaken more than 50 arthroscopic procedures and 57% achieved a level-4 PBA grading. Figures 3 and 4 demonstrate the experience of the respondents gained from both performing arthroscopic procedures and attending arthroscopy courses, respectively. When questioned about specific training on using the arthroscopic stack system, 82% of registrars answered in the negative and 87% responded that any courses they attended on arthroscopy failed to address this issue.

Considering that only 12% of the respondents claimed to be able to name the different parts of the stack system and only 11% claimed to be able to set up the system, it comes as no surprise that only 18% were able to deal with intraoperative delays due to stack system issues. Another perspective is that, despite 98% of registrars experiencing intraoperative delays due to stack system malfunction, 88% were not trained to manage the situation.

We then focused on more senior trainees in particular, as they would probably be more experienced with the arthroscopy stack system through performing more operations and attending more courses; 35% of all respondents (49 registrars) were ST7 or above in terms of experience (ST7, ST8, fellows), of whom 39 registrars had performed more than 50 arthroscopic procedures and had achieved a level-4 PBA grade. Some 32 of these 39 registrars (82%) were unable to set up the arthroscopy stack system and could not address intraoperative delays caused by equipment problems.

All the registrars responding to the survey were of the opinion that formal training on setting up and using the arthroscopy tower/stack system would be beneficial. In addition, 75% of them believed that this training should be

Figure 1 The arthroscopy stack/tower system.

part of the orthopaedic curriculum, with 58% of the opinion that both the curriculum and arthroscopic courses should cover this subject.

Discussion

Good Surgical Practice from the Royal College of Surgeons of England states that 'surgeons are responsible for keeping themselves up to date and maintaining competence in all areas of their practice'.¹¹ The orthopaedic surgeon comes into contact with a variety of equipment in the operating theatre. Competence in its use should be mandatory. The onus is always on the individual surgeon to

ensure competence and familiarity with equipment. Training programmes have to be and are constantly reviewed and improved to accommodate for changing requirements. These changes are sometimes brought about by trainees providing feedback on and evaluating their training and this is actively encouraged by trainers and training programme directors. The literature boasts many examples of these changes, including an article on safe use of mobile fluoroscopy in the operating theatre.¹² Questionnaires and surveys are a valuable means of gathering a general opinion on practice amongst doctors.^{13,14}

The safe practice of arthroscopy also includes the ability to navigate the stack system and resolve any basic and common technical problems that may be encountered during the procedure. Problems often encountered are with identifying the correct settings for white balance, picture quality and technical issues involving the irrigation and pump system. Some 82% of senior orthopaedic registrars deemed competent in arthroscopic procedures through training workplace-based assessments were unable to address intraoperative arthroscopic stack system-related delays independently. This demonstrates a deficiency of basic arthroscopic training. Aside from operating on patients in theatre, 70% of respondents had attended at least one arthroscopy course and 42% of these had attended three or more courses. A total of 87% of the respondents attending courses claimed that the arthroscopy stack/tower system setup and use was not addressed.

Box 1 Survey completed by orthopaedic trainees.

1. Which deanery are you training in?
List of 23 deaneries given
2. Level of training?
ST3, ST4, ST5, ST6, ST7, ST8, fellow
3. How many arthroscopic procedures have you undertaken as first surgeon?
0–20, 20–50, > 50
4. Have you got any level 4 PBAs in arthroscopic surgery?
Yes, No
5. How many arthroscopy courses have you been on?
0, 1, 2, 3 or more
6. Have you been trained on setting up and using the arthroscopic stack system?
Yes, No
7. Did any of the courses you attended deliver training on the stack system?
Yes, No
8. Have you had delays during surgery when using the arthroscopy stack due to pump failures, water flow problems, blockages, light source issues etc?
Never, A few times, Often
9. Are you able to deal with these yourself or have you had to wait for other theatre staff to rectify the issue?
Myself, Other staff
10. Are you able to name the different parts of the stack system?
Not at all, Partly, Fully aware
11. Can you setup the stack system yourself?
Yes, No
12. Would you like to have some training with regards to setting up and using the stack system?
Yes, No
13. Would you prefer this training to be part of the curriculum or included in the arthroscopy course?
Curriculum, Courses, Both

Figure 2 Percentage of respondents by training grade.

Figure 3 Number of arthroscopy procedures performed on any joint by respondents.

Figure 4 Number of arthroscopy courses attended by respondents.

There is clearly a lack of training and possibly a lack of initiative from trainees. There does not currently appear to be any formal training as part of the curriculum or consistently during external courses. We consider that this issue needs to be addressed appropriately and awareness should be raised about this issue by trainees on courses they attend. We hope that the simple process of filling out the survey would have highlighted any lack of competence to the respondents.

Study limitations

A limitation of our survey is that we were reliant on honest answers from our respondents, but we believe that

responses are more likely to overstate competence than the reverse. A greater number of responses would have been preferable to demonstrate the magnitude of what we perceive as a training inadequacy. We relied on generating an electronic mailing list of training programme directors from the British Orthopaedic Association handbook and their diligence in disseminating the questionnaire to the registrars in their respective deaneries. However, the available numbers, we feel, give us an accurate reflection of competence.

Conclusions

It is the duty of all surgeons to be aware of the equipment that they use in an operating theatre. A lack of such competence could result in compromise to patient safety and reduce the efficiency of theatre function. This study has demonstrated that the training delivered on operating the arthroscopic stack system is inadequate. This inadequacy is best managed by delivering training as part of the regional orthopaedic teaching in each deanery. Additionally, arthroscopy course organisers should be encouraged to spend some time addressing this issue. Ultimately, it is the responsibility of each surgeon to ensure adequate training. Preliminary feedback from consultant colleagues has alerted the authors to the possible inadequate training levels among consultants in the arthroscopic stack system and this is certainly an area for future investigation.

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