The Royal College of Surgeons of England

Ann R Coll Surg Engl 2004; **86**: 413–415
doi 10.1308/147870804669

Audit

A survey of current myocardial protection practices during coronary artery bypass grafting

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***Objective*: To identify current myocardial protection strategies for coronary artery bypass grafting (CABG) across the UK and Ireland.**
***Methods*: A questionnaire survey of 15 questions was sent to practising cardiac surgeons between June and October 2002. The list of surgeons was obtained from the Society of Cardiothoracic Surgeons of Great Britain and Ireland database and they were contacted by postal and electronic mail.**
***Results*: 118 (73.7%) out of 160 surgeons responded to the survey. 61 (51.7%) perform CABG on-pump (ONCAB) while 10 (8.5%) practice off-pump CABG (OPCAB). 47 (39.8%) perform either depending on individual cases. Of the 108 surgeons performing ONCAB, 91 (84.3%) use cardioplegia while 17 (15.7%) use cross-clamp and fibrillation techniques. Of those using cardioplegia, 76 (83.5%) use blood cardioplegia, 15 (19.7%) use warm-blood and 60 (78.9%) use cold-blood cardioplegia. 15(16.5%) use crystalloid cardioplegia. Retrograde cardioplegia is used by 23 (25.2%). We find an interesting variation of practice in relation to specifics like warm induction, graft cardioplegia, hot-shot, single cross-clamp, hypothermia and venting procedures. An overwhelming majority of surgeons performing OPCAB use the Octopus stabiliser (n = 44, 77.2%) with some others preferring the Genzyme system. Supplementary stabilisation is not commonly used. While most OPCAB surgeons use intracoronary shunts (n = 51), some prefer blockers (n = 9) and others use coronary sloops (n = 36). Ischaemic preconditioning is not commonly practised. Several surgeons have changed their practice of myocardial protection in the last 5 years (n = 45).**
***Conclusions*: This survey gives us an interesting insight into current myocardial protection practices in the UK and Ireland and may be useful for future reference.**

Key words: Questionnaire – CABG – Myocardial protection – Cardioplegia

In the last 50 years, cardiac surgery has developed into a highly specialised and sophisticated discipline with successful results for a wide variety of congenital and acquired cardiac abnormalities. As with the other specialities of surgery, many pioneering surgeons have contributed to these giant strides. It does not seem that long ago when to commit knife to the heart was considered foolhardy.[1,2]

However, all this has changed dramatically due to the foresight and ingenuity of several people. The rapid

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advances made in understanding cardiac physiology and the concept of myocardial protection have played an important role in the continued development of cardiac surgery. While the essence of myocardial protection has remained unchanged, *i.e.* to ensure that myocardial function and reserve are best preserved as surgery is being performed on the heart, the practices have changed significantly. Whereas, in the early days, myocardial protection was essentially a damage-limitation exercise aimed at minimising the damage to the heart as a result of the procedure, it is now considered as vital to not only minimise the damage but also to enhance myocardial reserves and functions.

The practice of off-pump coronary artery bypass surgery (OPCAB) has brought with it many interesting variations in the understanding and practice of myocardial protection. Keeping this in mind, we set out to evaluate current myocardial protection practices for coronary artery bypass grafting (CABG) in the UK and Ireland.

Methods

We carried out a survey of 15 questions, which were sent out to various practising cardiac surgeons in the UK and Ireland. The surgeons were identified from the Society of Cardiothoracic Surgeons (SCTS) and Cardiothoracic Surgeons Network (CTSNet) databases. We sent out a total of 160 questionnaires starting from June 2002 with reminders in August and September 2002 to ensure maximum response. We also contacted some of the surgeons by electronic mail.

The questionnaire was constructed so as to be simple yet comprehensive enough to reflect the widespread variations that exist in myocardial protection practices. We also endeavoured to cover different practices that exist both in on-pump CABG (ONCAB) and OPCAB.

Responses from the questionnaires were entered into a Microsoft Excel file (version 97) for data analysis.

Results

A total of 118 (73.7%) out of 160 surgeons responded to the survey. Of these 118, 61 (51.7%) perform ONCAB only, while 10 (8.5%) practice OPCAB exclusively. The remaining 47 (39.8%) perform either OPCAB or ONCAB, depending on individual cases. It is interesting to note that despite the fact that less than 10% of practising surgeons perform OPCAB routinely, another 40% tend to do it selectively. It will be interesting to monitor the changes in these numbers in the future. OPCAB is gaining popularity world-wide due to several theoretical advantages of avoiding cardiopulmonary bypass.

Of the 108 surgeons performing ONCAB, 86 (79.1%) use cardioplegia while 12 (11.1%) use cross-clamp and fibrillation techniques. The remaining 5 use either of these methods. Hypothermic fibrillatory arrest without cross-clamp seems to have fallen out of favour with surgeons.

Of those using cardioplegia, 76 (83.5%) use blood cardioplegia with 15 (19.7%) using warm-blood and 60 (78.9%) using cold-blood cardioplegia. Fifteen (16.5%) use crystalloid cardioplegia. While antegrade delivery remains the preferred mode of delivery of cardioplegia with 68 (74.7%) using it, nearly a quarter of the surgeons using cardioplegia use a combination of both antegrade and retrograde delivery (23; 25.2%).

Looking further into individual practices of the 91 surgeons using cardioplegia, we find an interesting variation covering the entire spectrum of cardioplegia delivery and temperature manipulation. Of the 29 who use warm induction, 15 do so frequently. Of the 54 surgeons who use topical cooling, 48 use it in most of their cases. Only 29 out of 65 surgeons, who use graft cardioplegia, do so frequently; the other 36 do so occasionally. 'Hot shot' is used routinely by 15 surgeons with another 31 doing so occasionally. Out of 72 surgeons, 44 prefer to do all their grafts including the top ends on a single cross clamp, while the rest do so occasionally.

Venting is always used by 68 out of 108 surgeons using ONCAB (63%), while 25 never use it (23.1%); the remaining 15 do so occasionally. The most commonly preferred route of venting the heart is through the aortic root with 64 surgeons preferring this route (59.2%). The pulmonary artery is the next commonly preferred site (15; 13.9%). The left ventricle and the right superior pulmonary vein are not as popular for CABGs.

A majority of the surgeons prefer mild hypothermia (temperature > 32°C) for performing their cases (40 out of 95, 42.1%) while 26 surgeons take the temperature down to between 28°C and 32°C (27.3%); the remaining 29 allow the temperature to drift without actively cooling (30.5%). The preferred temperature for a predominant majority of the surgeons is around 32°C.

Although only a small percentage of the surgeons actually perform OPCAB on all their patients (8.5%), there are a significant number of surgeons who have it in their armamentarium and use it in selected cases (39.7%). Hence, nearly half the total number of surgeons, practice OPCAB.

We note an interesting variation of practices with regards to myocardial protection strategies in this group of surgeons. Intracoronary shunts and coronary sloops are used by many practising OPCAB. Of the 51 surgeons using intracoronary shunts, 36 surgeons tend to use these in most of their cases, while 36 tend to use sloops. Intracoronary blockers are not popular and neither is the

practice of ischaemic pre-conditioning. The Octopus is the preferred stabiliser with 44 (77.2%) using it. A few surgeons use Genzyme and CTS as well. The Angelini stabiliser seems to be the preferred choice at one centre. Very few surgeons tend to use any form of supplementary stabilisation.

Interestingly, 45 surgeons have changed their myocardial protection strategies in the last 5 years, of whom 17 have done so in the last 2 years. The main changes have been from crystalloid cardioplegia to blood cardioplegia and from ONCAB to OPCAB. Some have also given up intermittent cross-clamp and fibrillation for cardioplegia.

Conclusions

This survey provides an interesting insight into current myocardial protection practices across the UK and Ireland. While it may not be possible to account for all the variations in practices and while one also acknowledges that there may be specific alterations in practices for a given case or scenario, this survey provides several interesting pieces of information, including the increasing trend towards OPCAB, loss of favour of hypothermic fibrillatory arrest, increasing trend towards blood cardioplegia and retrograde mode of delivery, continued usage of topical cooling, importance of performing all anastomosis in a single cross clamp and the wide-spread variations in venting and temperature manipulations while doing CABG.

It is also interesting to note that more than a third of the surgeons (45 out of 118; 38.1%) have changed their practices in the last 5 years.

We hope that this survey will act as a standard for comparison for any future report looking at myocardial protection practices across the country.

Acknowledgements

We appreciate the co-operation of all the consultant cardiac surgeons across the UK and Ireland who took time to reply to this questionnaire.

References

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