




Editorial

EVAR fever: minimally invasive, maximally inclusive?

Open repair of abdominal and thoracic aortic aneurysm inevitably involves clamping and unclamping of this major vessel and, consequently, major haemodynamic perturbation. Experienced vascular anaesthetists and good teamwork can ameliorate the peaks and troughs of blood pressure and heart rate with appropriate use of vasoactive drugs, fluid therapy and anaesthesia itself. Such levels of proficiency can only be reached by thorough training and experience, both in volume and quality. In recent times, endovascular aneurysm repair (EVAR) has revolutionised vascular surgery such that this technique has markedly surpassed that of open repair in most centres, heralding a change in the professional landscapes for both surgeons and anaesthetists. Similar to performing laparoscopic procedures, surgeons are required to create three dimensional experiences from two dimension information, a skill that is vastly different to that required for open repair. Anaesthetists are still exposed to patients with significant co-morbidities attendant with vascular disease and, since the surgical trauma is markedly reduced, many patients who would not be considered able to tolerate the stress of open surgery are now being offered EVAR. What, then, are the implications of this developmental shift?

It would be prudent first to consider the current status of EVAR within the realm of aneurysmal surgery. Recent publications of large trials comparing open versus endovascular repair have produced a rather similar message: EVAR provides an early survival advantage over open repair, but this benefit is eroded over time so that equivalence is evident by around the two-year mark [1–3]. Endovascular aneurysm repair is now recommended as a treatment for unruptured infrarenal aortic aneurysm by the National Institute for Health and Clinical Excellence, although the same body provided conflicting results for cost effectiveness of this approach for each quality adjusted life year [4]. The need for a suitable landing zone proximal to the aneurysm for graft deployment represents an evolutionary obstacle that currently prevents EVAR from taking over from the open procedure entirely. However, with improved training and technology such as branched and fenestrated devices, and the use of hybrid procedures requiring extra-anatomical arterial anastomoses, increasingly more lesions will become amenable to EVAR. Therefore, the number of EVAR procedures will continue to rise, but a certain proportion of aneurysms will still require open repair and hence the skills of an experienced anaesthetist. Herein lies

the rub: how to maintain expertise with managing open repair in the face of dwindling exposure and, consequently, how to train the next generation?

The problem of maintaining expertise and training for complex cases in the light of reduced exposure is not confined to vascular anaesthesia since interventional radiological procedures have gained ground in other specialties including cardiac and neurosurgery. There are no simple solutions. We could choose to surrender to the forces of supply and demand: fewer open cases means fewer workers are required to develop and maintain the skill set. This naturally will propel us further down the road of subspecialisation of anaesthesia. All will be well if it wasn't for the inconvenience of the emergency abdominal aortic aneurysm (AAA), a significant portion of which would still require open repair at present. It would then be left to chance whether the on-call anaesthetist is the  who is experienced in dealing with open AAA repair or not. For larger departments, this could in theory be dealt with by arranging the on-call system to balance out the spread of vascular expertise, though few departments would have this luxury. In areas of population density, there could be designated vascular surgery centres with a high throughput of cases.

1 Such 'centres of excellence' can
2 attract resources for specialised en-
3 dovascular operating theatres and
4 may have sufficient workload to
5 sustain a critical mass of vascular
6 anaesthetists providing a full 24-hour
7 service.

8 Further down the continuum of
9 this same problem is the issue of
10 training, with which one must be
11 more circumspect. After all, the
12 trainee must have adequate exposure
13 to a range of cases to achieve com-
14 petency as a Fellow of his/her
15 respective College. Unlike what an
16 economist may argue when a prod-
17 uct supply is scarce but the demand
18 high, anaesthetists do not have the
19 option of increasing supply or reduc-
20 ing the demand for training. Rather,
21 we have to rethink the whole issue of
22 training when it comes to such cases,
23 and as a specialty think of creative
24 solutions to 'modify' the supply.
25 Training alongside an experienced
26 anaesthetist in a one-to-one situa-
27 tion, with the trainee actively partic-
28 ipating in decision-making whilst
29 delivering care to a patient, can well
30 be considered a 'gold standard' of
31 training. Naturally, this form of
32 apprenticeship system would be dif-
33 ficult to sustain in an environment of
34 limited cases and reduced working
35 hours. One therefore should recog-
36 nise the preciousness of open AAA
37 repairs and ensure at least one
38 trainee is attached to each case, so
39 as not to squander these valuable
40 training opportunities [5]. A subse-
41 quent step then may involve expos-
42 ing two or more trainees to such
43 'designated' training cases, even
44 though it may dilute the experience
45 somewhat for each participant. No
46 doubt this practice takes place infor-

mally in many departments, but
formalising such an inclusive
arrangement at a departmental or
regional level would raise awareness
of this training imperative across the
specialty. One could make use of the
ready availability of video technology
nowadays and produce interactive
educational material from live foot-
age of cases. These could be inte-
grated with simulator training
scenarios to enhance the experience.
To accomplish this would require
time, resources and the dedication of
clinicians with strong educational
interests and skills. Thus we either
need to make the teaching value of
existing cases 'go around' further or
substitute the best experience with a
reasonable one. However, both the
trainee and the trainer must
acknowledge the limitations of such
approaches, especially with regards
to the non-technical aspects of
anaesthetic care, that are best honed
by managing actual cases under
supervision. Vascular surgeons have
already recognised this problem of
training in their own camp and have
advocated turning to simulation to
augment their training, as well as
calling for trainees to be sent to
centres with adequate workload [6].

Another implication from the
increasing number of EVAR is the
need to re-evaluate the actual role of
the anaesthetist. As surgeons sur-
mount the learning curve, EVAR
could appear remarkably straightfor-
ward from the surgical point of view,
with low rates of primary conversion.
However, anaesthetists must be cog-
nisant of the fact that patients
undergoing EVAR are not immune
to some of the problems associated
with open repairs, such as peri-


operative renal impairment [7], and
we should do what we can to min-
imise potential damage [8]. Fewer
intra-operative anaesthetic interven-
tions are required, and local anaes-
thesia with sedation is now a feasible
and increasingly popular option for
this procedure. Emerging data sup-
port this, with quoted success rates of
75% using a 'local anaesthesia first'
approach and a conversion rate to
general anaesthesia of 7.6% in se-
lected centres [9]. There is also
accumulating evidence from retro-
spective analyses of large databases,
attesting not only to the feasibility
but perhaps some advantages of
performing the procedure under
local or loco-regional anaesthesia
[10, 11]. The advantages, which
include reduced morbidity, early
mortality and ICU admission, seem
particularly prominent in high-risk
patients. One must bear in mind,
though, that these are retrospective
analyses with possible selection bias,
and prospective randomised data are
required to confirm these apparent
benefits. Robust clinical trials of
high-risk patients, comparing local
anaesthesia with sedation versus gen-
eral anaesthesia, are difficult to come
by, as elegantly argued by Hutchin-
son in the case for transfemoral
transcatheter aortic valve implanta-
tion in a recent editorial in *Anaes-
thesia* [12]. In the absence of
confirmatory data, the anaesthetist
has the pivotal role in navigating the
patient through the decisional matrix
for the choice for anaesthesia and,
thereafter, to deliver the anaesthetic
care by the chosen technique safely
and smoothly.

A shift from general to local
techniques with sedation does not

1 necessarily imply a downward shift
2 of skills required. Though perhaps
3 not considered as 'challenging' in the
4 traditional sense, one must not
5 underestimate the task of providing
6 anaesthetic care to these patients
7 using this technique. Rather, the
8 anaesthetist should adopt a cautious
9 and inclusive approach that involves
10 a thorough evaluation and discussion
11 with the patient and with the sur-
12 geon. After all, many of these
13 patients are considered at high risk
14 for open procedures or general
15 anaesthesia. It should be remem-
16 bered also that anaesthesia care does
17 not just involve choice of drugs/
18 technique but also pre-operative
19 optimisation of co-morbidities and
20 postoperative care. Furthermore, les-
21 sons learned from previous closed
22 claims remind us of the devastating
23 consequences of sedation gone
24 wrong [13]. One must be aware of
25 the anticipated duration of the pro-
26 cedure to decide whether it is rea-
27 sonable to consider local anaesthesia
28 with sedation. Surgeons need to be
29 advised that patients may not be
30 immobile for the entire time and
31 they need to be comfortable with that
32 for the given anatomy of the lesion.
33 Simple patient factors, such as a
34 persistent cough or a bad back that
35 can make prolonged immobility
36 intolerable, can render success using
37 local anaesthesia difficult to achieve.
38 Patients need to be informed that
39 unawareness of the procedure may
40 not be achievable, and agree to this
41 before proceeding. In such circum-
42 stances it may be more appropriate
43 to combine local anaesthesia with
44 'light' general anaesthesia with a
45 supraglottic airway device. Thus
46 much work has to be done for these

patients before entering the operat-
ing theatres.

Deep sedation is generally inad-
visable for this setting, as co-opera-
tion is required for certain parts of
the procedure, e.g. breath holding.
Further, the ischaemic pain accom-
panying sheath insertion may not be
alleviated by local anaesthesia alone,
and dis-inhibition associated with
deep sedation may make co-opera-
tion even more difficult to achieve.
The use of opioids to alleviate the
ischaemic pain may be required but
these can cause synergistic respira-
tory depression. To this end, the
 α_2 -receptor agonist dexmedetomi-
dine may be a useful choice, as it
provides sedation with facilitated
arousal, minimal respiratory depres-
sion and some analgesic effect [14].
This drug has now been launched in
the UK, and has been used success-
fully elsewhere in this endeavour
[15]. It has become the first choice
sedative in our theatres, and is wor-
thy of further evaluation for EVAR
procedures in other local settings.

In the future, there could be
more spic  introduced into the
lives of vascular anaesthetists, with
increasing numbers of emergency
EVAR and hybrid procedures at-
tempted. Patients' condition would
typically be suboptimal in the case of
the ruptured AAA, and the potential
for haemodynamic disturbances are
higher in the case of the hybrids. In
the interim, those of us engaged in
providing anaesthetic care for vascu-
lar procedures should adopt an
'inclusive' attitude on several fronts.
With regard to the open repair,
include as many juniors as practical
to minimise the loss of skills in
dealing with such cases, and consider

the creation and inclusion of more
non-traditional approaches to train-
ing. The inclusion of the surgeon
and the patient in the choice of
anaesthetic technique is especially
important if contemplating the use
of local anaesthesia. Lastly, we
should include and probably take
greater ownership of the responsi-
bility for medical optimisation of
patients for these procedures. Com-
ments such as "Use of optimal
medical therapy was poor in the
UK EVAR Trials" and "it seems
likely that the high cardiovascular
event rates seen in these patients
could be reduced simply by a more
rigorous application of medical ther-
apy", made in a paper analysing
cardiovascular events in EVAR [16],
are particularly poignant to vascular
anaesthetists who are in the ideal
position to intervene on the patient's
behalf. Apposite use of pre-operative
clinics may not only have a favour-
able impact on vascular surgical
outcomes in the short term [17],
but enable otherwise 'missed oppor-
tunities' for secondary prevention of
cardiac disease to be seized, thus
augmenting our role as peri-operative
patient advocates [18]. Therefore, as
peri-operative physicians, perhaps
we should shift our paradigm and
consider that where we can make
the most difference for these patients
may lie outside the operating
theatres.

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G. T. C. Wong

Clinical Assistant Professor

Email: gordon@hku.hk

M. G. Irwin

Professor and Head

Chief of Service

Department of Anaesthesiology

University of Hong Kong

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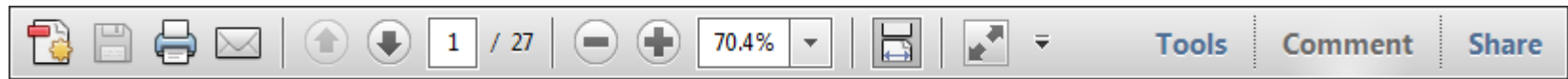
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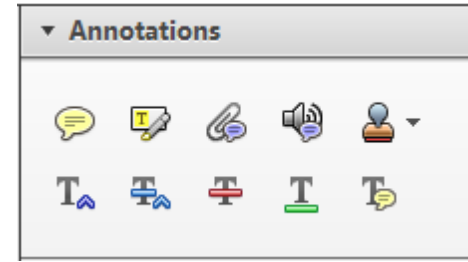
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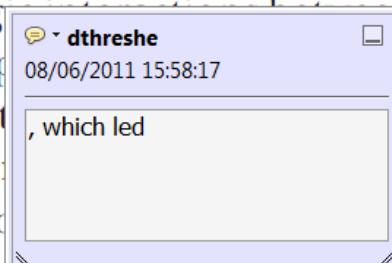


Strikes a line through text and opens up a text box where replacement text can be entered.

How to use it

- Highlight a word or sentence.
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- Type the replacement text into the blue box that appears.

standard framework for the analysis of microeconomics. Nevertheless, it also led to the emergence of strategic behavior in the number of competitors in the industry. This is that the structure of the industry, which led to the emergence of imperfect competition. The main components of the industry, which are exogenous to the industry, are important works on entry by Shirasaka (1987) and henceforth. We open the 'black b



2. Strikethrough (Del) Tool – for deleting text.



Strikes a red line through text that is to be deleted.

How to use it

- Highlight a word or sentence.
- Click on the Strikethrough (Del) icon in the Annotations section.

there is no room for extra profits and the number of competitors are zero and the number of competitors (net) values are not determined by the number of firms. Blanchard and Kiyotaki (1987), in their paper on perfect competition in general equilibrium, show that the effects of aggregate demand and supply shocks in the classical framework assuming monopolistic competition are an exogenous number of firms

3. Add note to text Tool – for highlighting a section to be changed to bold or italic.



Highlights text in yellow and opens up a text box where comments can be entered.

How to use it

- Highlight the relevant section of text.
- Click on the Add note to text icon in the Annotations section.
- Type instruction on what should be changed regarding the text into the yellow box that appears.

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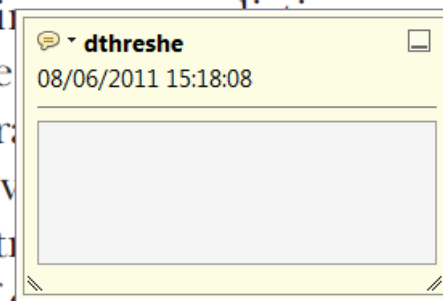


Marks a point in the proof where a comment needs to be highlighted.

How to use it

- Click on the Add sticky note icon in the Annotations section.
- Click at the point in the proof where the comment should be inserted.
- Type the comment into the yellow box that appears.

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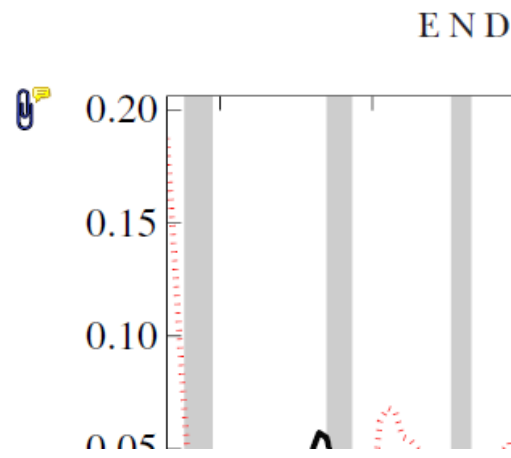
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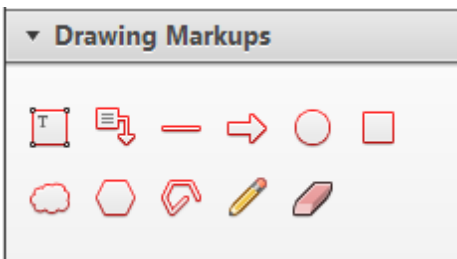


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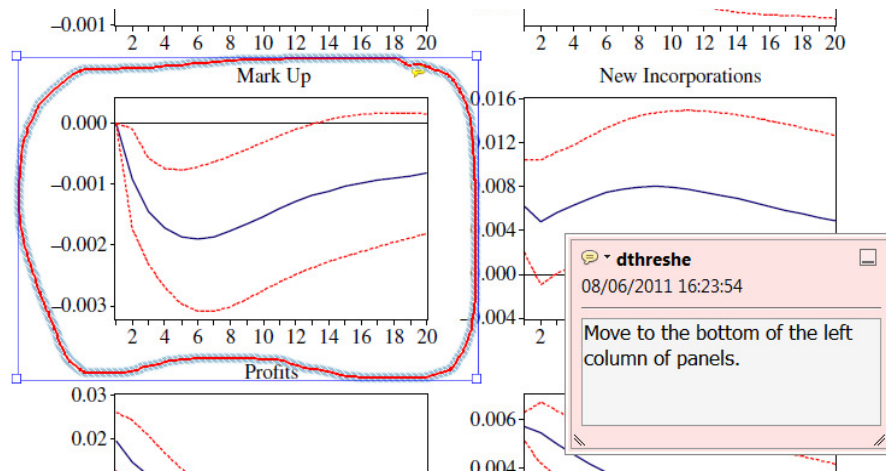


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