Lung Cancer Surgery

Lung Cancer Surgery:

What We Do, Why We Do It, and What If We Did It Differently?

By

David Waller

Cambridge Scholars Publishing

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I would finally like to acknowledge all those who I have had the privilege of training in lung cancer surgery over the last 4 decades. You may have heard some of the contents of this book somewhere before …

PREFACE

Are you not bored with all the standard thoracic surgical textbooks? Their similar formats, a structure based on familiar lines of specific pathological entities and operative techniques? Have you ever wanted to question some of the phrases or dogma which have never been clearly defined or challenged in such a textbook?

I will ask “how do you define resectability and operability?” and “do your really need a diagnosis before operating?”. I will question basic principles like “do you really know how much lung to remove in a cancer resection?” and “why do you love minimally invasive surgery so much?” How do you answer accusations of “futile surgery”? What factors determine risk of an operation and the compliance of the patient in perioperative therapy. Finally, I will question your acceptance of evidence in its various forms.

Aside from the traditional technical details of lung cancer surgery (with some particular tips and tricks) we will probe the uncomfortable truths of what it really means to be a modern surgeon. We will explore the complex inter-relationships within the various teams to which the surgeon belongs. Furthermore, we will confront what issues trouble the surgeon when the lights go out at night; the inner fears and trepidations.

This book will provide a fresh, contrarian look at the philosophy of lung cancer surgery by probing into the dogma which underpin many aspects of surgical management, and which require either justification or abandonment.

The text will adopt the format of a dialogue between trainee and trainer with the former challenging the latter to respond to what seem to be simplistic and direct questions about thoracic surgical practice**.** Each statement will include the relevant contemporary references to supportive publications with a short precis of their main points.

I have based the text on my lifetime experience of not only heated discussions in informal settings in coffee rooms between cases and in bars and restaurants around the world but in more formal staged debates in international conferences and in real-world lung multidisciplinary meetings with exasperated oncologists!

Wherever one is on the thoracic surgical ladder or in any part of the lung cancer team there should be interest. Trainees can use the content to stimulate intellectual discussion with their colleagues or superiors. Established surgeons can take a step back and look at their practice and think "could I do that differently?" or "I have never thought about it like that before".

I hope that the answers will *not* meet with universal agreement. Indeed, I hope that they stimulate disagreement and debate with interest in these topics rather than just blithe acceptance.

CHAPTER 1

SETTING THE SCENE

Imagine you are a senior surgeon, probably nearing retirement, who remembers their first lung cancer operation being a right pneumonectomy via a large posterolateral thoracotomy without even the benefit of a preoperative CT scan! Their last lung cancer operation has been a robotic assisted complex segmentectomy for a screen detected subcentimetre lesion diagnosed on navigational bronchoscopy. In other words, they have seen virtually the entire evolution of lung cancer surgery. Admittedly they were not present in September 1951 when Sir Clement Price Thomas performed a left pneumonectomy on King George VI in Buckingham Palace (the surgeon but not the patient knew the diagnosis) and generously removed the recurrent laryngeal nerve en-bloc. However, their first operation was closer to that date than the present day.

Now imagine you are a modern-day thoracic trainee. You have the world of information at your fingertips via the World Wide Web. Unfortunately, those fingertips have rarely been inside someone's chest cavity. There is a disconnect between your theoretical knowledge and its application to the real-world practice of lung cancer surgery. You are young enough to be the senior surgeon's child but they put you at ease and are happy to have frank conversations and answer (and ask) a wide range of relevant questions.

A series of informal "chats" have been arranged outside of the "tick-box" exercises so favoured by modern educationalists. These might be at the end of a ward round or outpatient clinic or in between theatre cases. The agenda is eclectic and to the trainee's surprise does not follow the traditional syllabus of thoracic surgical training. Instead, it is stimulated by a few keywords that the trainee will have used but may not have fully appreciated their context or content.

The discussions revolve around contentious statements or controversial questions but the discussants intersperse their discourse with reference to relevant and contemporary literature. The key messages of each reference are outlined.

The dialogue that follows is imaginary but of course is a synthesis of real conversations and debates experienced by the author, both as a trainer and trainee.

CHAPTER 2

TEAM

TRAINER: To what teams does the lung cancer surgeon contribute?

TRAINEE: The main teams are: the Lung Cancer multidisciplinary team (MDT) and the theatre team

How does the surgeon's role differ in those two teams?

The Lung Cancer MDT

I guess in the theatre team the surgeon is looked upon as the team leader whereas in the Lung MDT their role is more of specialist advisor.

Certainly, the role of the surgeon in the management of lung cancer has changed in the last 4 decades. From a more technical role where they were expected to often explore cases referred to them personally by a physician in the hope of resection the modern surgeon will (as we will discuss in the following chapters) be involved in decisions regarding diagnosis, the operability of the patient and the resectability of the tumour.

So, the surgeon may have to interact with several other specialists: physicians, radiologists, oncologists and pathologists. They will all have their own views which may not always be those of the surgeon.

Yes, and this is where the challenge is for the surgeon. They may have strongly held views but they will have to justify them with hard evidence to convince other members of the team.

The surgeon must keep themselves abreast of all the latest developments not just in surgery but across lung cancer oncology. This is particularly important if they are to debate any issues with the other disciplines.

Inevitably there will be differences of opinion within the MDT. As we shall see there will be several parts of the lung cancer pathway where the surgeon's opinion may differ from others. They may wish to resect without a prior diagnosis against the opinion of the interventional pulmonologist or radiologist. There may be a debate about whether to operate or give neoadjuvant therapy as first-line. There may be a debate regarding whether an R0 or R1 resection has been achieved with the pathologist.

It sounds like there may be an argument or two?

No, conflict of opinion can be productive providing that each member shows the others due respect and that discussions avoid being over emotional and that there are no personal implications attached.

In reality don't you think that team members will try to avoid conflict?

That is very likely and the surgeon may be faced with a decision reached by a majority which they do not necessarily support. The dreaded *groupthink* may prevail where, in an effort to maintain harmony a definitive decision may be deferred in favour of procrastination or in the pursuit of an absolute proof. Worst still is the colloquial phenomenon of "MDT Tennis" where the possibility of two primary tumours in lung and another site result in neither specialist MDT making the decision of "who goes first."

1.Janis IL. Groupthink. Psychology Today Nov 1971: 43-44, 46, 74-76. First introduced by psychologist Irving Janis, *groupthink* was defined as the situation when individuals tend to refrain from expressing doubts and judgments or disagreeing with the consensus of their peer group.

That's very useful information for a young surgeon without much experience of the MDT process. Are there any other team dynamics to be aware of?

Well, there are several but the new member of the MDT must be aware of inherent bias in decision making and various factors that may affect the MDT judgement or "noise". Bias is easy to predict: the surgeon sees a potential operation whereas the oncologist a potential case for radiotherapy. The physician, however, may see a frail, elderly patient who should be left alone. Noise is the inherent unwanted variability in judgements brought on by external factors. The same case discussed at the start of the meeting may result in a different decision if discussed 3 hours later just before lunch when everyone is tired and hungry!

Another example is the "who shouts loudest wins" phenomenon where the opinion presented in the most convincing fashion with the most persuasive rhetoric may sway the opinions of those less certain about the facts.

2.Ng IK, Goh WG, Nashi N, Gollamudi S, Lahiri M, Morgan DJ, Lim TK. Making better clinical decisions: How doctors can recognise and reduce bias and noise in medical practice. Ann Acad Med Singap. 2025 May 9;54(5):310-313. This interesting analysis outlies understanding how cognitive errors happen in medical decision making and suggest a series of workplace-based interventions that could help to improve this process.

Is there any way to reduce these factors of bias or noise affecting the MDT decisions?

Yes, the best way in many such environments is for the team to agree pre-determined guidelines for the most common situations. This move takes much of the unnecessary debate and uncertainty out of the meetings and leads to a smoother more time-efficient occasion. It is important, however, that the surgeon gets involved in creating these guidelines outside of the actual MDT meeting. These guidelines writing meetings may be more heated though!

Does the MDT take responsibility then for the decisions taken and management plans, particularly those affecting surgery?

They do but don't forget that the operating surgeon must be responsible for consenting the patient for an operation. So, the ultimate responsibility is with the surgeon whose "name is above the bed". This

may be not so straightforward when one surgeon may agree in the MDT that a particular operation is appropriate but a different surgeon may be allocated the case for the operating theatre.

Does the surgeon have to follow the MDT direction in that case?

Not if they are not entirely comfortable. It would be quite appropriate for the surgeon to defer to a colleague or to carry out their chosen procedure providing the patient gives fully informed consent. However, in the ideal world the operating surgeon should be present at the initial MDT discussion and all external pressures (often imposed by non-clinicians) should be, in my opinion, resisted.

You mention deferring to a colleague, that assumes that the colleague will be happy to take on the case or assume responsibility. I guess that assumes the surgical team is supportive and cohesive.

The Surgical Team

Absolutely, this is probably the most important team that a surgeon is part of. A dysfunctional team can detrimentally affect not only the mental well-being of its members but more importantly patient care.

What factors make for a functional surgical team in your opinion?

There must be mutual respect of each members capabilities and opinions. The days of the surgical consultant being an island or a "law-unto-himself" are long gone. The modern lung cancer surgeon must accept an element of "corporate responsibility" encouraged by unit-specific rather than surgeon-specific outcomes. Can you think of any practical examples?

Modern-day surgeons are entitled to leave periods so they must be confident to allow their colleagues to make decisions on their patients in their absence.

That is easier in the acute setting when a return to theatre is required bleeding or another life -threatening complication. But it should also apply to non-life threatening but stay-prolonging complications including persistent air leak or chylothorax. That is more difficult and

the default situation of waiting until the surgeon returns from leave to deal with the problem is very tempting.

I can imagine. But what about when everyone is around and the surgeon is faced with unfamiliar situations in patient selection or perioperative management. The best teams will be supportive with verbal and practical assistance.

Definitely, but for this to be a reality there needs to be a broad range of experience and expertise to create the best lung cancer surgery team. Ideally, there will be a senior member who can advise on selection and may be able to support a decision not to operate on the grounds of inoperability or unresectability or who can join the surgeon in operating theatre for an uncommon procedure or technique i.e. airway reconstruction or complex vascular anastomoses. It also helps if there is some sub-specialisation within the team.

Yes, I guess that with increasing technical advances in lung cancer management few surgeons can be masters of all aspects?

Techniques like navigational bronchoscopy, robotic assisted thoracic surgery, complex bronchoangioplastic resections or chest wall reconstruction may be specialized by only one or a few team members. Such cases can either be diverted or they can share their skills and educate other members.

OK but what makes for a dysfunctional team then?

A controversial question! I suppose when there is unnecessary competition between members of a similar age, experience and point in their careers. The motivation may be financial (if there are fee-paying patients) or simply professional prestige. This scenario of similar-stage surgeons may be inevitable but the consequences are not.

Are the team-dynamics not taken into consideration by appointment committees?

A very pertinent point. Unfortunately, in many situations the appointment committees may include very few members of the actual

surgical staff and in the pursuit of fairness and transparency many appointments are made based entirely on the single interview. I am surprised that more attention is not placed, as I believe it is in large corporations, on how an applicant will fit into the existing team as well as the merits of their curriculum vitae and interview skills. How a particular personality will fit into the existing group should be of paramount importance.

The Operating Theatre team

So finally, how should the surgeon manage their relationship with their operating team?

What do you think are the most important qualities to exhibit?

The surgeon has to demonstrate leadership by showing that they have a plan for the cases for each team member with an understanding of likely risks and methods of rescue if needed. They need to be assertive but remain calm, relaxed and approachable. All team members need to feel appreciated and their opinions valued. Then after the case they need to be able to critically review the team's performance and identify learning points for the future.

Excellent. The NOTECHS (or non-technical skills) system developed in the aviation industry in the late 1990s to improve safety can be adapted for the operating theatre environment. Basically the team-related skills of the surgeon can be considered in these 4 categories: leadership and management; teamwork and cooperation; problem solving and decision making, and situation awareness. *Leadership* comprises the ability to inspire and motivate while being assertive with planning, keeping to standards and allocating tasks appropriately. *Teamwork* includes supporting other members and understanding their needs while keeping calm in resolving any conflict. Obviously, the surgeon has to be a *decisive problem-solver* but must be willing to consider others options and know the limitations. *Situation awareness* requires the surgeon to know what is happening with the patient at all times but also to be able to anticipate what is going to happen next and communicate that to the team.

3.Catchpole K, Mishra A, Handa A, McCulloch P. Teamwork and error in the operating room: analysis of skills and roles. Ann Surg. 2008 Apr;247(4):699-706. In a detailed analysis of interactions and the NOTECHS system improved teamwork and communication were shown to have beneficial effects on technical performance and patient outcome in the operating theatre environment.

Wow, it sounds like there is a lot more to being a good surgeon than being able to operate. But surely the emphasis can't all be on the surgeon?

There may be different opinions between members of how good the teamwork actually is and the surgeon must be prepared to take feedback from other disciplines. There may be an over-reliance on measures such as the World Health Organization Surgical Safety Checklist which many surgeons may see as the panacea but which may leave some team members dissatisfied.

4.Makary MA, Sexton JB, Freischlag JA, Holzmueller CG, Millman EA, Rowen L, Pronovost PJ. Operating room teamwork among physicians and nurses: teamwork in the eye of the beholder. J Am Coll Surg. 2006 May;202(5):746-52. They found serious differences in perceptions of teamwork in the operating theatre: doctors rating the teamwork of others as good, but simultaneously, nurses perceiving teamwork as only mediocre.

5.Carney BT, West P, Neily J, Mills PD, Bagian JP. Differences in nurse and surgeon perceptions of teamwork: implications for use of a briefing checklist in the OR. AORN J. 2010 Jun;91(6):722-9. Perioperative nurses who participated in the survey rated teamwork higher with other nurses than with surgeons, whereas surgeons rated teamwork high with each other and with nurses. Differences in perception between members of the different professions should not be underestimated.

6.Urban D, Burian BK, Patel K, Turley NW, Elam M, MacRobie AG, Merry AF, Kumar M, Hannenberg A, Haynes AB, Brindle ME. Surgical Teams' Attitudes About Surgical Safety and the Surgical Safety Checklist at 10 Years: A Multinational Survey. Ann Surg Open. 2021 Jul 6;2(3):e075. More nurses lacked confidence regarding their role in the Checklist process than surgeons.

So before considering whether you know how to operate and on whom the surgeon must know who they are supposed to or expected to be.

Very insightful. It used to be said that a patient would prefer an excellent technical surgeon who was an absolute st than a lovely man who couldn't operate himself out of a paper bag!**

Oh dear!

These are no longer acceptable alternatives. The lung cancer surgeon of the 21st Century must be technically competent but their patients' care will suffer if they cannot function successfully within a team of their contemporaries and other disciplines. However, both aspects must be adequately addressed.

As we shall explore the surgeon's relationships with other will influence not only how they choose to operate but also what risk they are prepared to take and what fear this engenders.

Pause for thought:

"No Man is an island"
—John Donne, 1624

No surgeon exists outside of their respective teams.

CHAPTER 3

OPERABILITY

TRAINER: How would you define who is operable?

TRAINEE: Well, if I can get all of the tumour out safely and enable the patient to leave hospital.

Yes, but let's differentiate between "operability" and "resectability". The patient is operable or not and the tumour is resectable.

So you could have a resectable tumour in an inoperable patient and an operable patient with an unresectable tumour?

Exactly. But resectability, as we shall see later, is a bit more nuanced. Now, is operability just about being able to survive the required extent of resection?

No, I guess the patient will want to have a reasonable quality of life even if only for a few years.

True. So, the assessment of operability must include some way of predicting postoperative quality of life in terms of exercise ability and psychosocial functioning.

But predominantly the main concern of the surgeon is the ability of the patient to survive the lung cancer operation in the face of his associated co-morbidities. What are the main conditions that may affect the ability of the patient to survive the operation?

I suppose the two main co-morbidities in this population of smokers or ex-smokers are chronic obstructive pulmonary disease (COPD) and ischaemic heart disease (IHD).

Yes, in the real world these are the two main lines of preoperative investigation. The surgeon must consider 1) how much lung function will the patient be left with after the required resection and 2) what is the risk of the patient suffering a perioperative myocardial infarction?

7.Lim E, Guidelines on the radical management of patients with lung cancer. Thorax. 2010 Oct;65 Suppl 3:iii1-27. A comprehensive review of selection criteria for both resectability (slightly outdated now) and operability (still relevant now) with useful algorithms.

Lung Function

If we consider lung function first, how would you estimate the postoperative predicted values?

I would start with simple measures of the dynamic lung volumes: forced expiratory volume in one second (FEV_1) and forced vital capacity (FVC). Then using a simple calculation of how many segments must be removed derive the predicted postoperative FEV_1.

8.Zeiher BG, Predicting postoperative pulmonary function in patients undergoing lung resection. Chest. 1995 Jul;108(1):68-72. Describes the method of estimating lung function by segment counting.

And what cut-off would you be happy with to continue directly to surgery?

I think that leaving the patient with less than 40% of predicted values increases the risk of complications so I would allow a predicted postoperative value of 50%.

That sounds very sensible but does that mean that surgery is never an option for the remainder?

Not necessarily because as we have said a large proportion of this lung cancer population will also have significant COPD which may offer a potential therapeutic option for lung volume reduction.

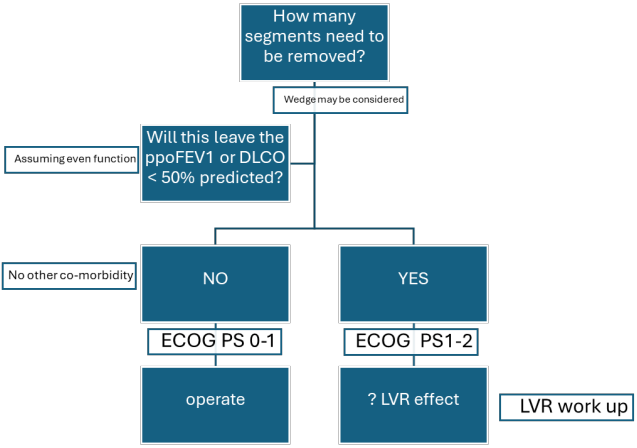

Fig 3.1 Initial lung function assessment

Exactly, and if the tumour is within an under perfused emphysematous part of the lung then its resection may have little effect on postoperative lung function. There may even be a beneficial "lung volume reduction" effect if the patient's lungs are hyperinflated.

9.Ju JW, Clinical Factors Affecting Discrepancy Between Predicted and Long-term Actual Lung Function Following Surgery. Clin Nucl Med. 2024 Nov 1;49(11):e574-e579.Shows the benefit of selecting those with poor target perfusion for a lung volume reduction boost in predicted lung function

So, we should work up these patients for potential lung volume reduction surgery with measurements of static lung volumes and identify potential target areas?

10.Plones T, The nodule in the emphysematous lung: an appeal for surgery in a lung volume reduction concept. J Thorac Dis 2023; 15:3266-3171. A review of all the literature in support of extending the principles of lung volume reduction to increase the range of operability.

Correct. The assumption that all parts of the lung have equal function which in a population of predominantly elderly smokers does not seem to be likely. Of course, most patients with a degree of emphysema will

have more damaged lung in the upper lobes. How can you assess this distribution?

The severity of destruction can be estimated from the degree of emphysema on a CT scan and the functional assessment by a perfusion scan. Ideally a SPECT scan fusing the two imaging modalities to give a “functional map”.

Fig 3.2 SPECT/CT scan showing under perfused left upper lobe

11.Kristiansen JF, Perch M, Iversen M, Krakauer M, Mortensen J. Lobar Quantification by Ventilation/Perfusion SPECT/CT in Patients with Severe Emphysema Undergoing Lung Volume Reduction with Endobronchial Valves. Respiration. 2019;98(3):230-8.

So, the patient may still be operable if the suspected tumour is in an area of potential lung volume reduction. It may even be possible to perform a limited resection if the tumour is in an area of well perfused lung if the ipsilateral lobe is a target for lung volume reduction.

Fig 3.3 Secondary assessment of lung function for potential lung volume reduction

And the remainder can be considered for Stereotactic radiotherapy (SABR).

Yes, those where there is relatively homogeneous perfusion throughout the lung.

We have discussed lung function but should we also take into consideration of operability the patient's exercise ability?

Certainly, there has been shown to be a correlation between limited exercise performance and higher postoperative morbidity and

mortality and therefore operability. But the question for the surgeon is what is the best method of assessment?

I thought that measurement of maximal oxygen consumption (VO_2 max) by cardiopulmonary exercise testing was the "gold standard" and that all higher risk patients should undergo this investigation?

Possibly not as there does not appear to be a general cut-off in VO2max below which the patient can be deemed inoperable. There are other less complicated methods to evaluate exercise tolerance which should be considered first.

12.Rocco G, Gatani T, Di Maio M, Meoli I, La Rocca A, Martucci N, La Manna C, Stefanelli F. The impact of decreasing cutoff values for maximal oxygen consumption (VO(2) max) in the decision-making process for candidates to lung cancer surgery. J Thorac Dis. 2013 Feb;5(1):12-8. A prospective study showing a lack of a specific cut-off value in predicting postoperative complications.

I am aware of structured assessments including the six-minute walk test (6MWT) and the incremental shuttle walk test (ISWT). I also know that some surgeons still use the stair climbing test.

13.Boujibar F, Gillibert A, Gravier FE, Gillot T, Bonnevie T, Cuvelier A, Baste JM. Performance at stair-climbing test is associated with postoperative complications after lung resection: a systematic review and meta-analysis. Thorax. 2020 Sep;75(9): 791-797.

14.Brunelli A, Pompili C, Salati M. Low-technology exercise test in the preoperative evaluation of lung resection candidates. Monaldi Arch Chest Dis. 2010 Jun;73(2): 72-8.

All these are valuable methods to screen the operability of a potential surgical candidate although none are exclusion criteria in themselves. Interestingly, in assessment for lung volume reduction surgery the values given for selection are far less than those quoted for lung cancer surgery and cardiopulmonary exercise testing is rarely used.

15.Buttery SC, Lewis A, Kemp SV, Banya W, Quint JK, Steiner MC, Hopkinson NS. Lung volume reduction eligibility in patients with COPD completing pulmonary

rehabilitation: results from the UK National Asthma and COPD Audit Programme. BMJ Open. 2020 Nov 27;10(11):e040942.

But have we not just said that we may be extending operability by applying the principles of lung volume reduction (LVR)?

Indeed, and actually surgery can be carried out in patients with very poor lung function with acceptably low mortality. I think there needs to be cross-over of experience between those few centres practising LVR and the many more lung cancer surgery centres.

16.Greening NJ, Vaughan P, Oey I, Steiner MC, Morgan MD, Rathinam S, Waller DA. Individualised risk in patients undergoing lung volume reduction surgery: the Glenfield BFG score. Eur Respir J. 2017 Jun 1;49(6):1601766. A 90-day mortality of 1% in patients with severe emphysema undergoing LVRS.

Now let us consider the other significant co-morbidity in smokers undergoing lung cancer surgery. What cardiac parameters are important in assessing operability?

Cardiac Disease

A history or new symptoms of ischaemic heart disease requires investigation and treatment to minimize the risk of perioperative myocardial infarction.

Similarly, newly diagnosed aortic valve disease requires assessment and intervention.

What are your thoughts on the timing of these interventions relative to the lung resection?

I would avoid the temptation to combine heart and lung surgery as the combination may compound the individual risk of the procedures and may compromise their accuracy. In general, the cardiac risks should be addressed prior to the lung operation which should proceed via the usual approach rather than sternotomy.

17.Cheng S, Perioperative outcomes of combined heart surgery and lung tumor resection: a systematic review and meta-analysis. J Cardiothorac Surg. 2021 Aug 9;16(1):227.

Combined procedures are possible but off-pump cardiac surgery is preferable.

18.Tourmousoglou CE, Simultaneous occurrence of coronary artery disease and lung cancer: what is the best surgical treatment strategy? Interact Cardiovasc Thorac Surg. 2014 Oct;19(4):673-81.

Combined off-pump cardiac surgery and lung resection are possible but cardiac surgery should take primacy if patient is unstable.

Are there any other cardiac concerns?

Yes, as any lung resection will remove part of the pulmonary vasculature then the afterload on the right ventricle will be increased. Therefore, evidence of pulmonary hypertension or right ventricular dysfunction requires urgent attention and may preclude tumour resection.

Is operability a fixed state of presentation?

No, I would hope that there is scope for modification in the preoperative period.

Yes, there is usually a window of opportunity to maximize the patient's fitness with attention to treating all co-morbidities effectively (including cardiac factors as above); assuring optimum nutritional status and addressing mobility and exercise ability.

Prehabilitation

I am aware that so-called prehabilitation may improve operability, patient outcome and therefore widen selection for surgery.

19.Voorn MJJ, Franssen RFW, Hoogeboom TJ, van Kampen-van den Boogaart VEM, Bootsma GP, Bongers BC, Janssen-Heijnen MLG. Evidence base for exercise prehabilitation suggests favourable outcomes for patients undergoing surgery for non-small cell lung cancer despite being of low therapeutic quality: a systematic review and meta-analysis. Eur J Surg Oncol. 2023 May;49(5):879-894.

There is only low certainty but some compelling evidence that prehabilitation improves postoperative outcomes, however, there is little evidence that it can make inoperable patients subsequently operable

Do you have an upper age limit for operability?

I am aware of many series of successful lung cancer operations in octogenarians and anecdotal reports of nonagenarians. So, I guess it all depends on the fitness of the patient.

20.Baldvinsson K, Resection rate and operability of elderly patients with non-small cell lung cancer: Nationwide study from 1991 to 2014. Interact Cardiovasc Thorac Surg. 2017 May 1;24(5):733-739. Resection rate decreases with age but results are comparable in those fit enough for resection.

What is the perceived benefit of surgical resection over other methods of local tumour control including radiotherapy or ablation?

Maybe equivalent 1–2-year survival but superior 5-year survival for surgery.

21.Paul S, Lee PC, Mao J, Isaacs AJ, Sedrakyan A. Long term survival with stereotactic ablative radiotherapy (SABR) versus thoracoscopic sublobar lung resection in elderly people: national population based study with propensity matched comparative analysis. BMJ. 2016 Jul 8;354: i3570.

Cancer specific survival diverges after 1 year in favour of surgery

So, can I suggest that a sensible assessment of the operability of a patient in their 80s would be their natural life expectancy?

Which should include the life expectancy from any co-morbidities.

Exactly, the surgeon must be satisfied that the patient will most likely die from their untreated lung cancer before any other of their conditions of natural old age!

22.Venuta F, Diso D, Onorati I, Anile M, Mantovani S, Rendina EA. Lung cancer in elderly patients. J Thorac Dis. 2016 Nov;8(Suppl 11):S908-S914. An analysis showing that the mortality from untreated lung cancer in the elderly is significantly worse than their natural life expectancy.

What about at the other end of the age spectrum? Should younger patients be subjected to more aggressive procedures just because they have more chance of operative survival?

That certainly is a familiar argument but whilst the decision to operate will rarely be limited by the operability of the patient the criteria for resectability of the tumour should not be altered by the age of the patient.

Let's examine resectability in more detail in a later chapter.

Pause for thought:

Operability depends on the patient's ability to survive the surgery with an acceptable quality of life.

Operability should be an individualized phenomenon based on the proposed functional loss and may be improved by tailored preoperative intervention.