

RAPID REVIEW:
Pinnaplasy (Otoplasty): Clinical effectiveness & clinical commissioning policy

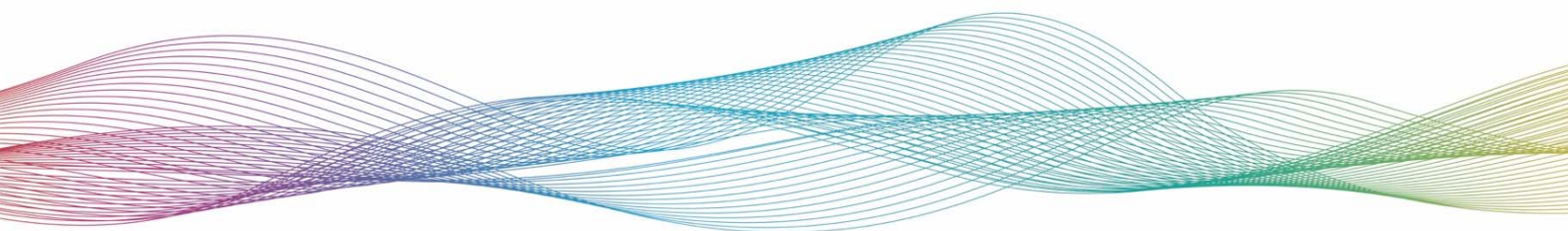
Sian Falder

Consultant plastic surgeon, Alder Hey Children's hospital

John Hampson

Consultant in Public Health, Midlands and Lancashire CSU

July 10th 2019

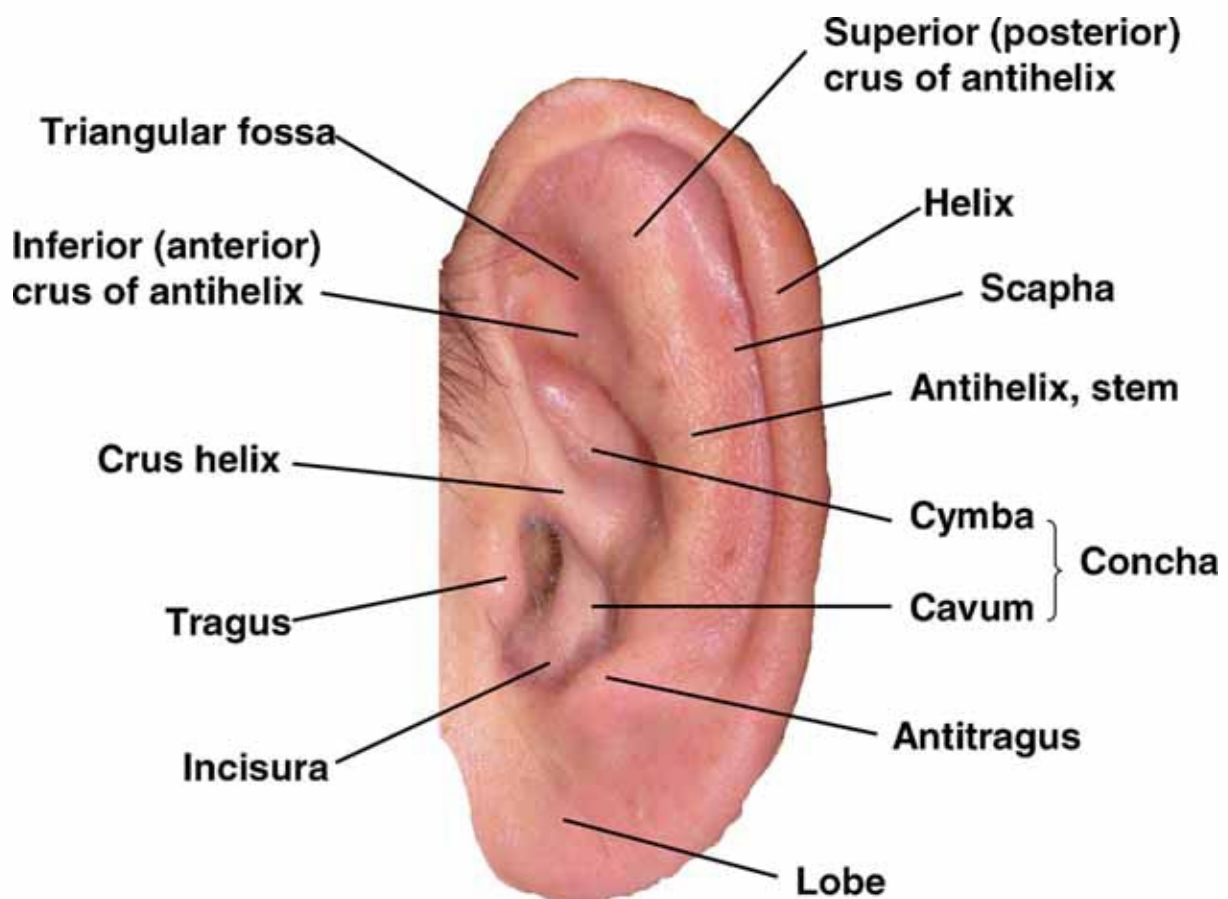


INTRODUCTION

Although protruding ears (sometimes referred to as “bat ears”) are common, there is no clear consensus in the literature regarding how this should be defined. ¹ Whilst a normal auricle protrudes 20 – 30° from the skull ², one author defined “prominent” ears as those which protrude from the side of the head at an angle greater than 40 – 60°. ³ Around 5% ^{4,5} to 6% ³ of the population are thought to possess prominent ears.

This common congenital deformity of the external ear rises from a combination of defects in the antihelix and concha parts of the ear ⁶ (see figure). ‘Prominent ears’ are classified by Tanzer as a type V deformity⁷ and it is this deformity and its psychological effects which result which is the main indication for pinnaplasty surgery. Photographic examples are shown in the appendix.

Figure: *Anatomical parts of the external ear*



Surgical correction of prominent ear was first reported in 1845.² Since that time up to 200 techniques have been described.^{2,3,7} The large number of techniques could suggest there is no widely accepted procedure⁸ although in practice, today's operations are merely modifications of a handful of procedures initially carried out 40 – 50 years ago.⁹ Stewart, whilst commenting on the myriads of techniques which have been tried, suggested that "some have merit, some are ineffective, some are destructive and some fanciful" yet adopting an effective and safe technique should be based on proven efficacy and effectiveness to avoid early disappointment.¹⁰

The purpose of this report is to review the underpinning evidence on the clinical need and effectiveness of pinnaplasty (otoplasty) in prominent ears.

METHOD

Literature searches of Medline and Embase were performed using the keywords pinnaplasty, otoplasty and bat ears together with helix, mastoid and auriculocephalic angle. In addition, the databases and websites of Cochrane, Scottish Intercollegiate Guidelines Network (SIGN), NICE, NICE Evidence, British Association of Oral & Maxillofacial Surgeons and the Royal College of Surgeons were also searched.

References were scanned to identify any articles which discussed the need or clinical effectiveness of pinnaplasty. Ultimately, a total of 33 references were selected for close scrutiny.

FINDINGS

Psychosocial impact of prominent ears before and after surgery

According to Songu¹¹, children with protruding ears are often exposed to substantial psychological pressure e.g. teasing in school or even within their own family unit. This can have a serious impact on their psychosocial development and behaviour. Numerous studies attest to the psychological distress, emotional trauma and behavioural problems which protruding ears can inflict on children. Parents of affected children cite low self-esteem, general lack of self-confidence and social isolation in their children as the reasons why they have requested otoplasty. In one study, 47 children with prominent ears were evaluated preoperatively by a psychiatrist. The authors reported an increased tendency towards depression, lower achievements in school, lower self-esteem and socio-communicative problems in school and at home.

Songu used the Child Behaviour Checklist (CBC) both pre-and post-operatively to assess the impact of otoplasty on 107 consecutive children. Songu noted that of the 107 children, 57 (53%) had been referred by the paediatric psychiatry clinic because of high anxiety and psychological distress concerning their protruding ears. Statistically significant improvements in CBC scores were observed for anxiety and depression, social problems, difficulties in thinking, internalising/externalising problems, total social competence and

total behavioural problems as a result of otoplasty. Not all children with protruding ears, however, may experience psychosocial problems.

Several other authors have come to similar conclusions regarding the psychological impact of prominent ears in children. Janis suggested although the physiological consequences of prominent ears are negligible, the psychological effects can be substantial.¹² This is echoed by Pawar⁴ and additionally, psychological distress and bullying adversely affect these children and can cause significant social exclusion.⁵ An editorial in the *Journal of Plastic, Reconstructive and Aesthetic Surgery* further confirms that bullying and teasing at school together with a subsequent lack of self-esteem and self-belief are reasons why children and their parents may seek surgical correction.³ Finally, in NICE's guidance on incisional otoplasty¹³, the committee noted the psychological distress caused by protruding ears and the potential benefit of effective treatment particularly those which minimise scarring.

Effectiveness of surgery

One of the first studies of the psychological and social outcomes of prominent ear correction in children was performed by Bradbury in 1992.¹⁴ This was a prospective study of 30 children assessed preoperatively and 12 months post-operatively. Prominent ear correction improved wellbeing of 90% of the children although there was a very small group of acutely distressed children who remained dissatisfied with the outcome. These were the children who were socially isolated prior to surgery and so Bradbury concluded that careful screening and referral of these more distressed children was recommended.

Over 10 years later, Bradbury (*et al*) completed another retrospective study of 62 patients with significant auricular deformity.¹⁵ The participants (adults and children – numbers not specified) were surveyed a mean of 2.2 years after surgery and the results compared to a cohort of 362 normal patients. Seventy-one percent reported reduced self-confidence which had affected both their social life and leisure activity. Teasing was a prominent symptom in children (88%) and adults (85%) but this was a motivational factor for surgery in children only. Following surgery, 74% of adults and 91% of children reported an improvement in self-confidence resulting in enhanced social life and leisure activities. Auricular reconstruction had significant psychosocial benefits in the majority of patients.

Table 1: Effectiveness of otoplasty studies (2008 – 2018): Summary

Author (Year)	Participants	Study type	Measurement	Outcomes
Gasques ¹⁶ (2008)	n=30 children. Age = 6-14 years	Prospective cohort	Child behaviour checklist. State trait anxiety inventory. Children's depression inventory.	Improvements in almost all the assessed items. Concludes psychological problems can be improved by adequate corrective surgery.
Cooper-Hobson ¹⁷ (2009)	n=101 children. Age = 5-16 years.	Retrospective cohort	Questionnaire unspecified.	97% reported an increase in happiness. 92% reported an increase in self-confidence. 100% reported bullying reduced or stopped (all findings statistically significant).
Braun ¹⁸ (2010)	n=21 adults. n=41 children	Retrospective cohort	Glasgow Benefit Inventory. Glasgow Children's Benefit Inventory.	95% children & adults satisfied with result. Health related quality of life elevated in 95% (adults & children).
Bermueller ¹⁹ (2012)	n=164 children & adults	Retrospective cohort	SF – 36. Patient outcomes of surgery – head/neck.	Health related quality of life significantly increased. Most pronounced in early childhood (<10 years).
Hao ²⁰ (2013)	n = 50. Age ≤ 18 years	Retrospective cohort.	Glasgow Children's Benefit Inventory. Paediatric quality-of-life inventory.	Significant improvement in health related quality-of-life.
Dias-Vaz ²¹ (2018)	n= 134. Mean age = 10.9 years.	Prospective cohort.	Glasgow Benefit Inventory. Glasgow Children's Benefit Inventory.	79% satisfied with and 92% recommended surgery. Statistically significant higher scores in those who underwent surgery due to teasing, and in females.

Since Bradbury's work, a handful of other studies (total number of participants in excess of 500) have been published over the last decade (see table 1). Individual studies were small, comprised mostly children and in terms of design were retrospective cohorts (usually), uncontrolled and open. However, there is a consistently high (90% +) satisfaction rating with increased self-confidence and an overall improvement in health-related quality of life. This moderate quality evidence provides a strong indication that otoplasty, particularly in certain children with prominent ear, is an effective measure which fulfils a defined need.

It is worth highlighting Hao's work²⁰ whose linear regression analysis showed that history of teasing and expectation of a "life changing event" were significant predictors in the Glasgow Children's Benefit Inventory total score. Interestingly, this finding was later confirmed when statistically significant higher scores in satisfied patients were found in those who had undergone surgery due to teasing.²¹ Unsurprisingly, therefore, it has been suggested that psychological support should be provided for children who are experiencing psychological problems caused by their prominent ears.¹⁶

The cumulative incidence of early complications for otoplasty is low and has been reported to be from 0% – 8.4%.²² The most recent data show that the incidence of complications are bleeding/haematoma (2.5%), infection (0.8%), skin/wound healing problems (3%), scarring (1.6%), pain and itching (13%) and revision surgery (5%).²³

Definition of "prominent"

As stated, whilst a normal auricle is said to protrude 20 – 30° from the skull, the following helical – scalp distances have been cited as "normal" by Nazarian² :-

Superior (top) helical rim: 10 – 12 mm.

Midpoint: 16 – 18 mm.

Lobule: 20 – 22 mm.

A child's ear is said to reach 85% of the length of an adult auricle by the age 4 – 6 years.

Although the definition of a normal mastoid – helical distance (10 – 12 mm) in the upper 3rd of the auricle has been confirmed ²⁴, there is no clear consensus in the literature for a definition of “prominent” or “protruding” ear. However, Driessen performed a prospective cohort study in 102 children (aged 5 – 18 years) by using computer assisted anthropometry of photographs which he compared to 44 patients listed for ear correction. ¹

Driessen found a statistically significant difference between boys and girls. He proposed that an ear is prominent in boys when the protrusion exceeds 21.5 mm or 20.0 mm for the upper and lower protrusions respectively. In girls, an ear is prominent when the protrusion exceeds 17.5 mm or 15.5 mm for the upper and lower protrusions respectively. However, anecdotally, local clinical opinion suggests that the lower limit for girls would be unlikely to exhibit prominence.

An incidental finding was that the upper protrusion plays a larger role in the perception of prominence rather than the lower one and, therefore, the upper protrusion should be the main objective of corrective otoplasty.

Table 2: Changes in mean mastoid – helical distances following otoplasty

Author (Year)	Upper		Middle		Lobule	
	Pre-op	Post-op	Pre-op	Post-op	Pre-op	Post-op
Maclsaac * (2019) ²⁴	20.4mm	12.0mm	22.2mm	11.8mm	18.5mm	14.9mm
Schlegel- Wagner ** (2010) ²⁵	23.3mm	14.2mm	28.6mm	14.0mm	25.9mm	17.4mm

*n = 26 children mean age 8.2 years.

**n = 160 children and adults, mean age 11 yrs (range 3.5 – 31yrs)[12% of ears in patients older than 18years].

Table 2 gives some indication of the scale of reduction which otoplasty can achieve. The table cites two studies where mastoid – helical distances were measured both pre-and post operatively. Thus, otoplasty in these studies achieved a reduction in the upper portion of the mastoid-helical distance in the order of 40%.

Developing a policy

In 2009, a national survey of all Primary Care Trusts (PCTs) in England showed that the majority of respondents (two thirds) allowed prominent ear correction in children whereas 92% excluded pinnaplasty for adults. ²⁶ Four percent of PCTs required children to undergo psychological assessment before referral.

In the same year, Ahmad recognised the status of some “low priority” treatments which was leading to a “postcode lottery”. ³ In the case of pinnaplasty, attention was drawn to the need for evidence by some PCTs for a school report, psychological assessment or a multidisciplinary panel review. Ahmad asserted there were few surgical procedures which resulted in such a dramatic improvement in the self-esteem of a child with clear psychosocial benefits.

Since that time, following the introduction of Procedures of Limited Clinical Value (PLCV), a term first highlighted in the McKinsey report (2009), Shelton concluded there was no significant drop in the number of ENT procedures (including pinnaplasty) carried out pre- and post- 2009. ²⁷ However, there was significant inter-hospital variation at that time which was predicted to increase. There are no published data on how things may or may not have changed to date.

Currently, in its commissioning guide for pinnaplasty (2013) ²⁸, the Royal College of Surgeons recommends that pinnaplasty should be an option in the following groups:-

- children older than 5 years but less than 18 years.
- children younger than 5 years where correction will help to retain hearing aid more securely.
- should not be commissioned in adults over the age of 18 years.

In the USA, Aetna[†], the healthcare maintenance organisation, will only commission otoplasty to improve hearing by directing sound into the ear canal, otherwise the procedure is considered to be cosmetic. This policy doesn't take into account the significant psychological benefits of pinnaplasty for some children described above.

CONCLUSIONS & RECOMMENDATIONS

1. Protruding ears are common although there is no generally recognised standard definition regarding "prominent". A "normal" ear is where the upper helical – scalp distance is between 10 – 12 mm.
2. There is moderate quality evidence that some children with prominent ears experience substantial psychological distress due to their ears. This is often manifested by low self-esteem, lack of self-confidence, social isolation and in around half can even result in clinical anxiety and/or depression. Schoolwork inevitably suffers and there are socio-communicative problems both in school and at home. The observance of bullying and teasing may be an indicator of psychological and emotional distress in some although there will be a small cohort of others who suffer the same degree of distress yet these children "suffer in silence".
3. There is strong evidence that otoplasty (in children who are experiencing psychological distress as a result of their prominent ears) results in significant improvements in their wellbeing and health-related quality-of-life. Self-confidence and self-esteem are improved resulting in enhanced social and leisure activities. Post-operative satisfaction with the surgical procedure is extremely high.

[†] <https://www.aetna.com/health-care-professionals.html>

4. It is recommended that children with prominent ears should be offered otoplasty according to the following criteria:-
- Age $\geq 7^{\ddagger}$ years to ≤ 18 years AND
 - Prominent ear, upper 3rd mastoid – helical distance is ≥ 21.5 mm AND
 - During the clinical assessment, a consultant surgeon can verify that the child is suffering from significant psychological distress due to their prominent ears (in cases of bullying/teasing at school, provision of documented evidence from the head teacher (or equivalent) will complement this assessment)
 - The child and parent understand the risks, likely outcome and are motivated to proceed with surgery.
 - With the exception of functional reasons e.g. to keep a hearing aid in place or ears folding over when asleep causing pain, all other cases of pinnaplasty will not be commissioned.

APPENDIX

Examples of Tanzer type V prominent ears



[‡] Local clinical opinion dictates that children younger than 7 years should not undergo pinnaplasty because of additional surgical risks.

REFERENCES

1. Driessen JP, Borgstein JA, Vuyk HD. Defining the protruding ear. *The Journal of craniofacial surgery* 2011;**22**(6):2102-08. doi: 10.1097/SCS.0b013e3182326dfb
2. Nazarian R, Eshraghi AA. Otoplasty for the protruded ear. *Seminars in plastic surgery* 2011;**25**(4):288-94. doi: 10.1055/s-0031-1288921
3. Ahmad Z, Ahmad F. Pinnaplasty - A dwindling art in today's modern NHS. *Journal of Plastic, Reconstructive and Aesthetic Surgery* 2009;**62**(2):159-60. doi: 10.1016/j.bjps.2008.11.036
4. Pawar SS, Koch CA, Murakami C. Treatment of Prominent Ears and Otoplasty: A Contemporary Review. *JAMA facial plastic surgery* 2015;**17**(6):449-54. doi: 10.1001/jamafacial.2015.0783
5. Hope N, Smith CP, Cullen JR, et al. A retrospective study of patient outcomes and satisfaction following pinnaplasty. *Patient related outcome measures* 2016;**7**:49-53. doi: 10.2147/PROM.S99622
6. Fioramonti P, Serratore F, Tarallo M, et al. Otoplasty for prominent ears deformity. *European review for medical and pharmacological sciences* 2014;**18**(21):3156-65.
7. Walker FDL, Kubba H, Clement WA. Use of facial proportions in pinnaplasty assessment. *Journal of plastic, reconstructive & aesthetic surgery : JPRAS* 2011;**64**(8):1110-13. doi: 10.1016/j.bjps.2011.03.007
8. Yugueros P, Friedland JA. Otoplasty: the experience of 100 consecutive patients. *Plastic and reconstructive surgery* 2001;**108**(4):1045.
9. Petersson RS, Friedman O. Current trends in otoplasty. *Current opinion in otolaryngology & head and neck surgery* 2008;**16**(4):352-58. doi: 10.1097/MOO.0b013e328304b40d
10. Stewart KJ, Lancerotto L. Surgical Otoplasty: An Evidence-Based Approach to Prominent Ears Correction. *Facial plastic surgery clinics of North America* 2018;**26**(1):9-18. doi: 10.1016/j.fsc.2017.09.002
11. Songu M, Kutlu A. Long-term psychosocial impact of otoplasty performed on children with prominent ears. *The Journal of laryngology and otology* 2014;**128**(9):768-71. doi: 10.1017/S0022215114001662
12. Janis JE, Rohrich RJ, Gutowski KA. Otoplasty. *Plastic and reconstructive surgery* 2005;**115**(4):60e.
13. Incisionless otoplasty. Interventional procedures guidance. London: National Institute for health and care excellence, 2012.
14. Bradbury ET, Hewison J, Timmons MJ. Psychological and social outcome of prominent ear correction in children. *British journal of plastic surgery* 1992;**45**(2):97-100. [published Online First: 1992/02/01]
15. Horlock N, Vogelin E, Bradbury ET, et al. Psychosocial outcome of patients after ear reconstruction: a retrospective study of 62 patients. *Ann Plast Surg* 2005;**54**(5):517-24. [published Online First: 2005/04/20]
16. Gasques JAL, Pereira de Godoy JM, Cruz EMTN. Psychosocial effects of otoplasty in children with prominent ears. *Aesthetic plastic surgery* 2008;**32**(6):910-14. doi: 10.1007/s00266-008-9179-x
17. Cooper-Hobson G, Jaffe W. The benefits of otoplasty for children: further evidence to satisfy the modern NHS. *Journal of plastic, reconstructive & aesthetic surgery : JPRAS* 2009;**62**(2):190-94.
18. Braun T, Hainzinger T, Stelter K, et al. Health-related quality of life, patient benefit, and clinical outcome after otoplasty using suture techniques in 62 children and adults. *Plastic and reconstructive surgery* 2010;**126**(6):2115-24. doi: 10.1097/PRS.0b013e3181f449c7

19. Bermueller C, Kirsche H, Sebert A, et al. Quality of life and patients' satisfaction after otoplasty. *European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery* 2012;**269**(11):2423-31. doi: 10.1007/s00405-012-2060-1
20. Hao W, Chorney JM, Bezuhly M, et al. Analysis of health-related quality-of-life outcomes and their predictive factors in pediatric patients who undergo otoplasty. *Plastic and reconstructive surgery* 2013;**132**(5):811e. doi: 10.1097/PRS.0b013e3182a3c133
21. Dias-Vaz M, Estevao-Costa J, Morgado H, et al. Measuring otoplasty outcome: Expanding the validity to caregivers' perspective and to Portuguese-speaking children. *Clinical Otolaryngology* 2018;**43**(6):1513-21. doi: 10.1111/coa.13198
22. Limandjaja GC, Breugem CC, Mink van der Molen AB, et al. Complications of otoplasty: a literature review. *Journal of plastic, reconstructive & aesthetic surgery : JPRAS* 2009;**62**(1):19-27. doi: 10.1016/j.bjps.2008.06.043
23. Sadhra SS, Motaharisl S, Hardwicke JT. Complications after prominent ear correction: A systematic review of the literature. *J Plast Reconstr Aesthet Surg* 2017;**70**(8):1083-90. doi: 10.1016/j.bjps.2017.05.033 [published Online First: 2017/06/13]
24. MacIsaac ZM, Zammerilla L, Grunwaldt LJ. Treatment of the Prominent Ear: A Standardized Approach Without Intraoperative Measurements. *The Journal of craniofacial surgery* 2019;**30**(1):228-30. doi: 10.1097/SCS.0000000000004868
25. Schlegel-Wagner C, Pabst G, Müller W, et al. Otoplasty using a modified anterior scoring technique: standardized measurements of long-term results. *Archives of facial plastic surgery* 2010;**12**(3):143-48. doi: 10.1001/archfacial.2010.34
26. Henderson J. The plastic surgery postcode lottery in England. *International journal of surgery (London, England)* 2009;**7**(6):550-58. doi: 10.1016/j.ijssu.2009.09.004
27. Shelton F, Biggs T, Henderson A, et al. Procedures of limited clinical value in ENT: What effect has there been on operating numbers? *International Journal of Surgery* 2014;**12**
28. Commissioning guide: Pinnaplasty. 35-32 Lincoln's Inn Fields, London: The Royal College of surgeons of England, 2013:9.