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Trends in Immediate Post-Mastectomy Breast Reconstruction in the United Kingdom

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Structured Abstract

Background

The study aimed to evaluate local and national trends in immediate breast reconstruction (IBR) using national English administrative records, Hospital Episode Statistics (HES). Our prediction was an increase in implant only and free flap procedures and a decline in latissimus flap reconstructions.

Methods

Data from an oncoplastic centre were interrogated to derive numbers of implant only, autologous LD, LD-assisted and autologous pedicled or free flap IBR procedures performed between 2004 and 2013. Similarly, HES data was used to quantify national trends in these procedures from 1996-2012 using a curve fitting analysis.

Results

National data suggest an increase in LD procedures between 1996 (n=250) and 2002 (n=958), a gradual rise to 2008 (n=1398) followed by a decline to 2012 (n=1090). Nationally, the numbers of implant only and deep inferior epigastric perforator flap reconstructions increased from 1996 (implant: n=8005, DIEP: n=37) to 2012 (implant: n=13953; DIEP: n=454). As a percentage of total IBR, trends in LD flap reconstruction better fit a quadratic (R^2=0.97) than a linear function (R^2=0.63), confirming a proportional recent decline in LD flap procedures. Conversely, autologous (non-LD) flap reconstructions have increased (1996=0.44%, 2012=2.76%), whilst implant only reconstructions have

declined (1996=95.42%, 2012=84.92%). Locally, seventy implant assisted LD procedures were performed in 2003/4 but only two were performed in 2012/13.

Conclusion

Implants are the most common IBR technique, autologous free-flap procedures have increased and pedicled LD flap procedures are in decline. However, a considerable number of LD breast reconstructions are performed in England, which may represent geographical preferences or access to advances in implant based and free flap surgery.

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Main Manuscript

Immediate Breast Reconstruction (IBR) is associated with improved quality of life, body image, self-esteem and confidence (1, 2), and has become an increasingly popular choice amongst patients undergoing mastectomy (2) (3). IBR techniques fall into two broad categories: (a) implant alone reconstruction performed either as a two-stage procedure with tissue-expansion followed by exchange for a fixed-volume implant or as a single-stage direct to fixed-volume implant, and (b) autologous reconstruction necessitating either pedicled flaps (*e.g.* Latissimus Dorsi myocutaneous flap) or free tissue transfer (*e.g.* Deep Inferior Epigastric Perforator flap). Of the autologous approaches to IBR, the latissimus dorsi (LD) myocutaneous flap, often regarded in the United Kingdom (UK) as the "workhorse" of reconstructive breast surgery, has enjoyed popularity owing to its relative simplicity and versatility. In suitable candidates, an extensive dissection to maximise tissue harvest can facilitate an entirely autologous reconstruction, known as the "extended LD", which avoids complications of abdominal tissue harvesting such as abdominal bulge and hernia. A more common strategy is to use the LD muscle flap to provide additional soft tissue coverage for implant-based reconstruction (Implant-assisted LD), with the goal of superior cosmetic outcomes when compared with musculo-fascial coverage utilising the pectoralis major and serratus anterior muscles in isolation. With the development of microvascular surgery enabling fascio-cutaneous flaps to be raised, sparing muscle pedicles to derive its blood supply, an intuitive prediction of practice trends would be a reduction in the number of procedures associated with muscle harvest such as the LD, given its attendant morbidity.

Donor site complications that arise following IBR with the LD include donor site seroma, pain from scarring (4-8), and muscle weakness of the shoulder girdle (9-11). Improvements in the reliability, durability and consistency of IBR using free flaps such as the deep inferior epigastric perforator (DIEP) flap have resulted in better complication profiles of autologous reconstruction (12). The addition of acellular dermal matrices (ADM) to implant reconstruction facilitates a single stage *'direct to implant'* procedure (13), by improving implant cover, better infra-mammary fold definition and reducing capsule formation following prosthetic BR (13). In our practice, we have observed patients selecting expander or implant reconstruction, with or without ADM, or alternatively autologous techniques involving abdominal tissue transfer, rather than the LD *per se*.

Our hypothesis is that a recent shift has occurred toward a pattern of IBR practice that is less reliant on the LD flap. Declining trends in IBR techniques has important implications for councils for graduate medical education in establishing benchmark caseloads for residents to be credentialed in reconstructive surgery, and may help inform commissioning of reconstructive services. To test our hypothesis, an analysis of the number of IBR procedures performed each year over the last ten years was conducted using data from our institution and a Hospital Episode Statistics (HES) database, which covers all NHS hospitals in England, to evaluate similarities in IBR trends.

MATERIALS AND METHODS

Tertiary Centre Referral Data

The Royal Marsden NHS Trust (RMH) is a specialist oncoplastic centre, receiving approximately 1,000 new breast cancer referrals and performing approximately 150 IBR procedures each year. A search of the local procedure coded database and administrative systems at this institution was conducted to identify patients undergoing mastectomy and immediate reconstruction from 1st April 2003 to 31st July 2013. Similar search criteria were used to interrogate national data available from HES (see Table 1). Crude procedural numbers were derived and categorised according to the type of reconstructive procedure(s) based on specified sets of codes from the Office of Population Censuses and Surveys Classification of Surgical Operations and Procedures (OPCS-4).

Hospital Episode Statistics and Data Extraction Methodology

HES is an administrative dataset that collates data pertaining to patients admitted to NHS hospitals in England. Admissions contain both diagnostic and up to 24 procedure fields, coded using the OPCS system. HES data were analysed to include all patients undergoing mastectomy in combination with a reconstructive procedure between 1st April 1996 and 1st April 2013. Data were categorised according to the type of reconstructive procedure as defined in Table 1. The combination of mastectomy and simultaneous reconstruction ensured that the current analysis was restricted to practices in immediate reconstruction.

Procedures that included the OPCS code for LD flap (B29.1) without any other OPCS code were assumed to represent extended LD procedures. Implant-

assisted LD procedures were identified by presence of the OPCS code for LD flap in combination with any code for expanders, implants and/or theatre devices (S48.2, B30.1, B30.8, B30.9, T85.2, T86.2, T87.3, T91.1). Similarly, implant or expander only reconstructions were identified by the presence of their respective OPCS codes in the absence of other reconstruction codes. There is currently no OPCS code specific for ADM, hence the frequency of ADM based reconstruction could not be ascertained. Autologous tissue flaps were predominantly derived from the lower abdominal pannus; in accordance with modern surgical practice we focused on DIEP reconstructions. However, the OPCS code specific for DIEP (B39.3) was only employed from March 2006 onwards. Prior to March 2006, a single OPCS code (B29.3) was used to define reconstruction of the breast using *'free'* or *'pedicled'* rectus abdominis myocutaneous (TRAM) flap, other specified reconstruction using lower abdomen and unspecified reconstruction using the lower abdomen. We therefore describe these procedures as "Abdominal Flaps"; given procedural heterogeneity, the inability to dissect trends in different abdominal flap procedures and the nature of hypothesis i.e. trends in LD versus autologous abdominal flap procedures.There is currently no OPCS code for transverse gracilis myocutaneous flap (TMG) and therefore a code describing breast reconstruction "other specified" (B29.8) was used. Bilateral procedures were not considered separately.

Curve Fitting Analysis

Curve fitting is a method for finding the best-fit line to a set of data points. Lines of 'best-fit' were computed to determine whether trends in the proportion of LD

flap reconstruction better fit a linear or quadratic i.e. parabolic function. If as predicted, free flap reconstruction and implant only reconstructions have increased and as a proportion of total IBR practice LD flap reconstructions have decreased, then the data should better fit a quadratic than a linear function. Data were analysed using IBM SPSS Statistics (Version 22).

RESULTS

Local Specialist Centre

As illustrated in Figure 1 and Table 2, a steady decline in the number of IBRs involving LD flap harvest at our institution was observed. For example, in the year 2004/05 the unit performed 70 post-mastectomy LD-assisted reconstructions (of 125 IBRs), by 2009/10 this figure had already fallen to 18 (of 155 IBRs), and by 2012/13 only 2 procedures (of 176 IBRs) involved an implant assisted LD flap. By comparison, over the same time period, implant only and autologous abdominal flap procedures increased. In 2004/5, 35 expander-implant procedures and 11 DIEP reconstructions were performed at the RMH, and by 2012/3 the annual number of these procedures had increased to 98 and 67 respectively. In 2003-2004, LD-assisted reconstructions represented just over half (54%) of total IBR practice volume at the RMH, whereas in 2012-2013 it represented only 1%. Conversely, as a proportion of total practice volume, DIEP flap reconstructions have substantially increased from 9% in 2003-2004 to 38% in 2012-2013.

National Hospital Episode Data

To distinguish between local practice variations and a national epidemiological shift, HES data were interrogated to determine whether a decline in LD reconstruction was mirrored across units in England. HES data (Table 3) suggest that the numbers of IBR have doubled from 8,389 in 1996 to 16,430 in 2012. As a percentage of immediate IBR practice, year on year, expander/implant reconstructions remain the most frequently practiced procedure (i.e. accounting for >85% of IBR volume). However, longitudinal trends suggest a proportional

increase in DIEP flap reconstructions (1996 = 0.44%, 2007 = 1.37%, 2012 = 2.76%), a steady decline in implant only reconstruction (1996 = 95.42%, 2007 = 87.17%, 2012 = 84.92%), and a more recent decline in LD flap procedures commensurate with local data (1996 = 2.89%, 2007 = 7.81%, 2012 = 6.22%). HES data suggests that between 1996 and 2012, LD reconstructions comprised <10% of all reconstructive practice. Even at the height of popularity (2008/9), LD reconstructions represented only 8% of total IBR practice.

National Trend Analysis: Curve Fitting

As highlighted in Figure 2a, crude rates of LD-expander procedures have increased linearly. However, Figure 2b demonstrates that the proportion of LD reconstructions better fit a parabola rather than a linear function. The results of curve fitting confirm that the percentage of LD breast reconstruction better fits a quadratic (R^2=0.97, p<0.001) as opposed to a linear function (R^2=0.63, p <0.001). We further explored HES data by individual unit. Commensurate with local data, a declining trend in LD procedures (2003-2012) was identified for a number of NHS Trusts (n=33). As illustrated in Figure 3 (a-d) this trend was observed both in oncoplastic units as well as specialist oncoplastic centres with same site oncological and reconstruction services.

DISCUSSION

This study demonstrates that as a percentage of total IBR practice, immediate LD flap reconstructions are in substantial decline in specialist centres and in recent decline in the UK in general. Implant-only reconstruction remains the most frequently performed procedure, although autologous abdominal free tissue transfer has increased in popularity within specialist practice and the UK at large. These findings are reinforced by our own observations of the choices patients are making for IBR. Indeed, in our oncoplastic centre, the number of LD flap reconstructions and especially implant-assisted LD procedures has significantly dwindled. Explanations for these shifting patterns in reconstructive practice and comparisons with data regarding IBR practice in the USA merit further discussion.

Comparison between UK and USA Post Mastectomy Reconstructive Practice

Trends in IBR in the United States (USA) and UK are summarised, compared and contrasted in Figure 4. Similar to the UK trends highlighted (Table 3), data from the Surveillance, Epidemiology and End Results (SEER) database suggests that IBR are increasing (3, 14). Indeed, a recent analysis of data from the National Inpatient Sample (NIS) database suggested that IBR rates have increased by 78% from 20.8% in 1998 to 37.8% in 2008 (14).

Although data suggests that implant based reconstruction remains popular on both sides of the Atlantic, figures from the USA suggests rates of autologous reconstruction that are either stable or in decline (14-16). For example, Albornoz et al (14) observed that whilst rates of autologous breast reconstruction were

stable, implant reconstruction increased by approximately 11% per annum and a 5% year on year decrease in autologous reconstruction 1998-2008 (14, 16). Similarly, Jagsi et al (15) observed an increase in implant reconstruction and a corresponding decrease in the rate of autologous breast reconstruction from 56% in 1998 to 25% in 2007 and speculated that this might reflect either patient preferences for simpler procedures, procedural complexity of microsurgical reconstruction or financial disincentives that may complicate reconstructive decision making in the USA (15). For example, one study estimated that surgeons were reimbursed $587 per hour for implants and $322 per hour for autologous reconstructions. Others have suggested theatre productivity and operating room bottlenecks may be to blame since in the time taken to conduct a free-flap, several implant-based reconstructions may have been performed (14). The increase in bilateral mastectomy rates (17, 18) and the fact that bilateral (vs unilateral) was a predictor for implant reconstruction in the NIS study (14) suggests that a desire for reconstructive symmetry may play also play a role.

Finally, microsurgical skills training may be an issue. Kulkarni and colleagues (19) surveyed 500 active US members of the American Society of Plastics Surgeons and observed that only a 1/4 offered microsurgical reconstruction (19). This notwithstanding, recent US data from Academic Institutions suggests patterns of reconstructive practice that more closely resemble the trends observed at the RMH (20). Specifically, Dasari et al (20) identified an increase in autologous flap reconstruction from 2007-2013, and a longitudinal decline in LD reconstruction from 9.4 cases / surgeon in 2007 to 3.9 cases / surgeon in 2013

(20).

Role of New Technologies and Improvements in Autologous Reconstruction

We suspect that the recent decline in the proportion of LD-based reconstruction observed both locally and nationally may be influenced by technical improvements in both implant only reconstruction and autologous abdominal techniques. The development of a range of ADMs that provide an extracellular scaffold to support musculo-fascial implant coverage enable revascularisation and tissue integration as well as improving contour, shape and ptosis is currently revolutionising implant-based reconstruction. Emerging data suggest that implant reconstruction with ADM reduces the rates of capsular contracture, need for re-operative intervention and improves aesthetic outcomes versus two-stage sub-muscular tissue expansion (21, 22). Proposals for systematic regulation of prostheses in the UK (23), the increase in contralateral mastectomy rates (hence elevated morbidity incurred from bilateral LD harvest) (23) and evidence to support improved outcomes in the setting of radiotherapy (24) are likely to sustain the observed popularity in implant-based reconstruction. Moreover, practical benefits include operating room utility and productivity. Critically, the operative time required for implant reconstruction using ADM is considerably shorter than that for an LD-based reconstruction (25). Similarly, the introduction of the DIEP flap has improved the complication profile of abdominal free tissue transfer with far lower rates of abdominal weakness and bulge compared with the pedicled-Transverse Rectus Abdominis Myocutaneous (p-TRAM) flap (12), and superior patient satisfaction over LD reconstruction (26).

Complication Profile and Role of LD Flap Reconstruction in Modern Practice

Post-operative complications of LD-based IBR such as donor site seroma formation (4-8), breast animation (27, 28) and functional shoulder weakness (9-11) may have seen the LD fall out of favour in certain local centres and indeed in the UK nationally. Certainly, the results of curve fitting analysis suggest that there is a more recent decline in LD flap reconstruction. However, given that approximately 1000 LD flap reconstructions are performed each year (see Table 3), a body of UK surgeons still believe that LD based breast reconstruction has a role. In our view, there are specific circumstances in which deployment of the LD flap is especially useful. In particular, the extended LD flap provides an option for patients wishing to pursue autologous reconstruction but in whom abdominal free tissue transfer is deemed unachievable (*e.g.* damage to host perforators from previous abdominal surgery or slim individuals who lack a sufficient abdominal panniculus). Similarly, in patients considered to be too high risk for free-flap reconstruction (*e.g.* morbid obesity, smokers, diabetics) the LD flap has a superior complication profile (29).

Patients undergoing extensive resection for locally advanced or locally recurrent breast cancer, with widespread cutaneous involvement or chest wall fixation require reconstruction to cover exposed vital structures, ensure timely closure to avoid delaying adjuvant therapy and improve quality of life (30, 31). The LD flap is a useful salvage strategy in patients who have failed either implant-only reconstruction or autologous abdominal techniques. The LD "mini-flap" offers a tangible volume replacement option to maintain cosmesis in breast conserving surgery (32, 33), whilst endoscopic, robotic, muscle-sparing and scar-less

techniques may facilitate IBR whilst simultaneously limiting donor complications (34, 35).

Strengths and Limitations

The strength of this study is in the ability to compare and contrast practice variation nationally, with those from a specialist oncoplastic centre. There are recognised limitations intrinsic to administrative databases that may bias our results. Several codes were used for expanders and implants, and combinations of these codes often appeared in a single procedure. There is no code for ADM, which makes it impossible to confirm if the apparent popularity of implant-based reconstruction is being maintained by the benefits of this new technology. Finally, the absence of a DIEP specific code prior to 2006 meant that any abdominal autologous reconstructions captured prior to that date were likely to reflect a heterogeneous combination of DIEP, TRAM and / or Superficial Inferior Epigastric Artery (SIEA) flaps.

CONCLUSION

Implant based breast reconstruction remains the commonest reconstruction method in the UK. Autologous reconstruction with perforator flaps are more likely to be offered in specialist and academic institutions. A considerable number of LD flaps are still performed in England, which may reflect the access to such technical developments across the country leading to geographical variation in practice. Reconstructive surgeons should not be de-skilled in LD flap reconstruction since it has a role in chest wall resurfacing, as a salvage

reconstruction technique and in patients deemed not to be suitable for either implant-only reconstruction or abdominal free tissue transfer.

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Tables

Table 1 Categorisation of Immediate Breast Reconstruction by OPCS codes

Reconstruction Category	Combination of OPCS Procedural Codes	OPCS-4 codes
Latissimus Dorsi	Reconstruction with Latissimus Dorsi	B29.1
Latissimus Dorsi in combination with expander or implant	Reconstruction with Latissimus Dorsi	B29.1
	Expander, Implant or Theatre Device	S48.2, B30.1, B30.8, B30.9, T85.2, T86.2, T87.3, T91.1
Expander-Implant only	Expander	S48.2, B30.1, B30.8, B30.9, T85.2, T86.2, T87.3, T91.1
Abdominal tissue flap reconstruction	Free TRAM	B29.3 (OPCS4.2), B391. (OPCS4.4)
	Pedicled TRAM	B29.3 (OPSC4.2) B39.2 (OPCS4.4)
	Specified lower abdominal flap	B29.3 (OPSC4.2) B39.8 (OPCS4.4)
	Unspecified lower abdominal flap	B29.3 (OPSC4.2) B39.9 (OPCS4.4)
	DIEP	B29.3 (OPCS 4.2) B39.3 (OPCS 4.4)
Abdominal tissue flap in combination with expander or implant	Expander, Implant or Theatre Device	S48.2, B30.1, B30.8, B30.9, T85.2, T86.2, T87.3, T91.1
	Reconstruction using flap of skin abdomen	B29.3
	DIEP	B29.3 (OPCS 4.2) B39.3 (OPCS 4.4)
	Free TRAM	B29.3 (OPCS4.2), B391. (OPCS4.4)
	Pedicled TRAM	B29.3 (OPSC4.2) B39.2 (OPCS4.4)
	Specified lower abdominal flap	B29.3 (OPSC4.2) B39.8 (OPCS4.4)
	Unspecified lower abdominal flap	B29.3 (OPSC4.2) B39.9 (OPCS4.4)
All Autologous IBR*	Reconstruction using gluteal flap	B38.1, B38.2, B38.8, B38.9
	Reconstruction using abdominal flaps including DIEP	B39.1, B39.2, B39.3, B39.4, B39.5, B39.8, B39.9, B29.3
	Reconstruction other specified	B29.8

Table 1 Legend: OPCS = Classification of Interventions and Procedures, DIEP = deep inferior epigastric perforator, IBR = immediate breast reconstruction, *Interrogated for HES data only.

Table 2 Trends in Immediate Breast Reconstruction 2003-2013 at the Royal Marsden NHS Foundation Trust

Reconstructive Procedure	**Episode of Interest [Data represent n= (% of total IBR practice volume)]**									
	2003-2004	*2004-2005*	*2005-2006*	*2006-2007*	*2007-2008*	*2008-2009*	*2009-2010*	*2010-2011*	*2011-2012*	*2012-2013*
LD	3 (2.70)	9 (7.20)	9 (7.83)	19 (15.97)	10 (6.49)	18 (10.90)	19 (12.26)	11 (6.32)	7 (4.61)	9 (5.11)
LD and Expander	60 (54.01)	70 (56.0)	70 (60.87)	39 (32.77)	32 (20.78)	23 (13.94)	18 (11.61)	8 (3.38)	8 (5.26)	2 (1.14)
Abdominal Tissue Flap	1 (0.90)	11 (8.8)	16 (13.91)	23 (19.34)	36 (23.38)	45 (27.27)	57 (36.77)	54 (36.49)	56(36.84)	67 (38.07)
Abdominal Tissue Flap and Expander	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.65)	0 (0)	0 (0)	1 (0.68)	1 (0.66)	0 (0)
Implant Only	47 (42.34)	35 (28.0)	20 (17.40)	38 (31.93)	48 (31.17)	79 (47.88)	61 (39.35)	74 (50.0)	80 (52.64)	98 (55.68)
Total	111	125	115	119	154	165	155	148	152	176

Table 2 Legend: IBR = immediate breast reconstruction, LD =latissimus dorsi, DIEP=deep inferior epigastric perforator.

Table 3

National trends in Immediate Breast Reconstruction 1996-2012

Year	Category of Reconstructive Breast Surgery														Total
	LD only	LD only as % of total IBR	LD plus expander-implant	LD plus expander-implant as % of total IBR	Total LD	Total LD as % of total IBR	Expander-Implant only	Expander-Implant only as % of total IBR	Abdominal Flaps	Abdominal Flaps as % of total IBR	Abdominal Flaps plus expander-implant	Abdominal Flaps plus expander-implant as % of total IBR	Autologous reconstruction (non-LD)	Autologous as % of total IBR	
1996	72	0.86	178	2.10	250	2.89	8005	95.42	37	0.44	36	0.43	61	0.73	8389
1997	109	1.21	237	2.64	346	3.71	8446	94.12	45	0.50	41	0.46	96	1.07	8974
1998	122	1.17	362	3.47	484	4.43	9737	93.22	53	0.51	63	0.60	108	1.03	10445
1999	137	1.22	436	3.88	573	4.85	10390	92.40	81	0.72	74	0.66	127	1.13	11245
2000	183	1.59	573	4.97	756	6.16	10418	90.41	112	0.97	89	0.77	148	1.28	11523
2001	198	1.63	615	5.06	813	6.26	11007	90.49	94	0.77	111	0.91	139	1.14	12164
2002	187	1.46	771	6.00	958	6.94	11534	89.80	108	0.84	109	0.85	135	1.05	12844
2003	203	1.50	830	6.15	1033	7.11	12092	89.64	108	0.80	123	0.91	134	0.99	13490
2004	213	1.58	822	6.09	1035	7.05	12200	90.43	126	0.93	112	0.83	172	1.28	13645
2005	234	1.61	983	6.78	1217	7.75	12810	88.40	148	1.02	127	0.88	188	1.30	14490
2006	226	1.53	971	6.59	1197	7.51	12980	87.48	165	1.12	123	0.83	269	1.83	14734
2007	220	1.46	1057	7.01	1277	7.81	13140	87.17	206	1.37	138	0.92	313	2.08	15074
2008	268	1.74	1130	7.32	1398	8.31	13252	85.87	225	1.46	197	1.28	360	2.33	15433
2009	288	1.82	1034	6.53	1322	7.70	13551	85.54	292	1.84	242	1.53	435	2.75	15842
2010	306	1.83	1108	6.64	1414	7.82	14181	85.02	364	2.18	240	1.44	480	2.88	16679
2011	291	1.74	1040	6.24	1331	7.45	13938	83.57	429	2.57	241	1.44	604	3.62	16543
2012	242	1.47	848	5.16	1090	6.22	13953	84.92	454	2.76	316	1.92	617	3.74	16430

Table 3 Legend IBR = immediate breast reconstruction LD =latissimus dorsi. Abdominal Flaps (=free TRAM, pedicled TRAM, DIEP, specified flap from abdomen, unspecified flap from abdomen

Figure Legends

Figure 1.

Fig.1. Longitudinal variation in sub categories of immediate breast reconstruction performed at the Royal Marsden NHS Foundation Trust 2004 - 2013. Data episodes arranged sequentially according to financial year(s), such that 2004 data = number of reconstructive procedures performed 5th April 2003 – 5th April 2004; 2005 data = 5th April 2004 – 5th April 2005, etc. Fig.1. Legend: LD = latissimus dorsi, LDExpander=latissimus dorsi plus expander/implant.

Figure 2.

Fig.2. (a-b). Longitudinal trends in National LD flap immediate breast reconstruction rates for financial years 1996 - 2012. Charts highlight trends in LD-expander rates (a) and proportion of LD flap procedures expressed as a percentage of the total post mastectomy breast reconstruction load (b). Lines of *'best-fit'* for linear and quadratic functions are superimposed.

Figure 3.

Fig.3. (a-d). Trends in the crude numbers of implant assisted LD flap reconstructions across four UK NHS Trusts, 1996 - 2012. The plots for NHS Trusts (a-RP5 Doncaster and Basseltow NHS Trust), (b-RNZ Salisbury NHS Trust), (c-RVJ North Bristol NHS Trust) and (d-RYQ South London Healthcare NHS Trust), reflect a similar trend to that observed at the Royal Marsden NHS Foundation Trust (2003 - 2012).

Figure 4.

Fig.4. Longitudinal trends in proportions (% of total IBR) of each sub-type of breast reconstruction performed in United Kingdom (UK) and United States of America (USA). Charts depict proportional decrease in LD and implant based reconstruction and increase in autologous free flap reconstruction (top left), and the opposing trend observed in an insured population in the USA (27). Conversely, the reduction in LD flap reconstruction and increase in DIEP / free-flap microsurgery observed at the Royal Marsden NHS Foundation Trust (RMH) is mirrored in certain academic institutes in the USA (30). Fig 4 Legend: IBR= immediate breast reconstruction, LD = latissimus dorsi, DIEP= deep inferior epigastric perforator, Autog = autologous, and autog+ = autologous plus implant. Procedural schematic illustrations reproduced with permission from www.breastreconstruction.org.

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