An audit of surgical outcomes: the Chevron Akin procedure

Matt Rothwell MSc, BSc(Hons) PGCertPD, MChS, FHEA
Senior Lecturer in Podiatry, The University of Huddersfield, Podiatric Surgical Trainee, Mid Yorkshires Hospitals Trust
James Pickard MSc, FCPodS, FCPodMed, MChS, FHEA
Consultant Podiatrist, Mid Yorkshires Hospitals Trust, Senior Lecturer in Podiatry, The University of Huddersfield
& Teresa Morewood
Clinical Audit Facilitator, Mid Yorkshires Hospitals Trust

CONTACT

Matt Rothwell
Email: m.j.rothwell@hud.ac.uk

The Chevron Akin osteotomy is commonly used as an elective day-case surgical procedure for the correction of hallux valgus (HV) deformity. It is the second most frequently performed surgical procedure within the podiatric surgery service in Mid Yorkshire Hospitals Trust (MYHT). Clinical audit into the effectiveness of commonly performed techniques and procedures is required to provide evidence of effectiveness, cost-efficiency, safety and quality. Prior to this audit, no data existed to support the use of the Chevron Akin procedure within MYHT.

Literature surrounding HV surgery was reviewed and critically appraised in order to generate 10 surgical outcome criteria; these were used to benchmark the Chevron Akin osteotomy as performed in MYHT with national outcome data. The explicit criteria included infection rates, removal of metalwork and rates of revision surgery.

Following ethical approval, a retrospective audit of 86 patient records was conducted. The audit results for MYHT were then tested for statistical equivalence against national data from the Podiatric Audit of Surgical and Clinical Outcome Measures (PASCOM) audit tool. The results of the audit showed that surgical outcomes within MYHT are statistically and clinically equivalent with national PASCOM outcomes for many of the audit criteria. An exception is Infection rates, which were marginally higher with four cases in 86 patients in MYHT. However, of these, only two cases were confirmed via a positive swab report, and resolved with oral antibiotic therapy. There were no cases of osteomyelitis or avascular necrosis.

Overall, the MYHT clinical audit has shown the Chevron Akin procedure for the surgical correction of HV to be a safe, effective, technique, which is associated with low complication rates. In future, patient information leaflets and consent forms in MYHT will include information gathered from this audit, to assist the patient in giving informed consent, based on the likely benefits and risks associated with this type of elective foot surgery.

INTRODUCTION

Hallux valgus (HV) can be described as an osseous deformity of the first metatarsal phalangeal joint of the foot.[1] In some cases the deformity requires surgical correction, and there are over 150 different surgical techniques described in the literature.[2-5] In simple terms, modern surgical correction of HV involves making cuts to bone, repositioning the fragments and inserting screws or wire fixation to hold the fragments together in a corrected position, until they have healed. HV surgery is increasingly being performed on a day-case basis by podiatric surgeons under local anaesthesia.[3] National statistics suggest that post-operative complications for all podiatric surgery are relatively rare.[6]

Day-case surgery is beneficial for the patient as there is a reduced risk of complications such as infection and deep vein thrombosis. It is also beneficial for the NHS economy as there is usually no requirement for an expensive overnight ward admission for post-operative recovery.[7] A high-quality systematic review by Ferrari *et al* [8] published in the Cochrane database found that many forms of foot and ankle surgery have not been evaluated to a sufficiently high level.

Surgical outcomes or complication rates are important for the patient in elective surgery (surgery they choose to have) as it may help the patient to decide whether, on balance, the benefits of the surgery outweigh the risks.[9] In addition to patient factors, the research strategy for podiatry outlined by Vernon *et al* [10] emphasised the importance of collection of audit data in all sub-specialisms within podiatry, including podiatric surgery.

This aim of this audit is to establish complication rates for Chevron / Akin osteotomy procedures for the correction of HV within the forefoot surgery service at The Mid Yorkshire Hospitals NHS Trust (MYHT). The findings will be compared with national standards and complication rates held by the Society.

Data for comparison were obtained from the Podiatric Audit of Surgery & Clinical Outcome Measures (PASCOM); national complication rates were circulated by the Society to Fellows of the Faculty of Podiatric Surgery in 2009.[6] PASCOM is a database that clinicians populate with both procedure information and patient reported outcomes. Whilst previously it was a paper-based system, which was not considered wholly secure, in 2010 an electronic version (PASCOM-10) was introduced, which the MYHT signed up to and began contributing surgical information to in 2011. The database collates both surgical and non-surgical interventions, with the patient giving specific consent for their data to be submitted. PASCOM now contains over 10,000 data sets for surgical episodes and provides national pooled data, which is published by the profession and used as a benchmark for local audits. The data collected allows individual, teams and hospitals to evaluate surgical outcomes and patient satisfaction.

THE PROCEDURES

The Chevron (Austin) osteotomy

The Chevron osteotomy described by Miller[11] was eponymously accredited to Austin.[12] It is a common procedure used for the correction of HV in podiatry at MYHT. It is used for mild-to-moderate intermetatarsal (IM) angles of less than 15 degrees. This distal metatarsal osteotomy is surgically simple and quick to perform, with only one point of fixation. It is inherently stable and allows early mobilisation. There are mixed reports of the incidence of avascular necrosis (AVN)[13-15] with the Chevron technique, however, there are no formal MYHT data on AVN or other complications associated with this technique.

The Akin osteotomy

This procedure was first described by Akin in 1925 as a single procedure for the correction of HV.[16] The Akin osteotomy is often performed as an adjunct to a first metatarsal osteotomy such as the Chevron.[17] It is important to note there is a low patient satisfaction rate when this procedure is used in isolation[18] without a metatarsal osteotomy.

SURGICAL OUTCOMES CRITERIA FOR AUDIT BENCHMARKING

Ten surgical outcome criteria were generated via the judicious review and critique of best available research literature. The 10 criteria were identified, based on their potential for morbidity or mortality, and the MYHT rate was benchmarked against national standards and complication rates held by the Society, collated using the PASCOM system (see Table 1 and Figure 1).

AIMS & OBJECTIVES

Aim

To establish whether the service is effective at providing safe treatment, in line with national reported outcomes, for patients having the Chevron Akin osteotomy for HV correction.

Objectives

- Identify patients and review medical records to establish complications.
- Evaluate local complication rates and outcomes in order to benchmark against national figures.
- Present findings for discussion highlighting any areas of variance from national figures.
- Agree any actions that could be undertaken to improve outcomes or complication rates.

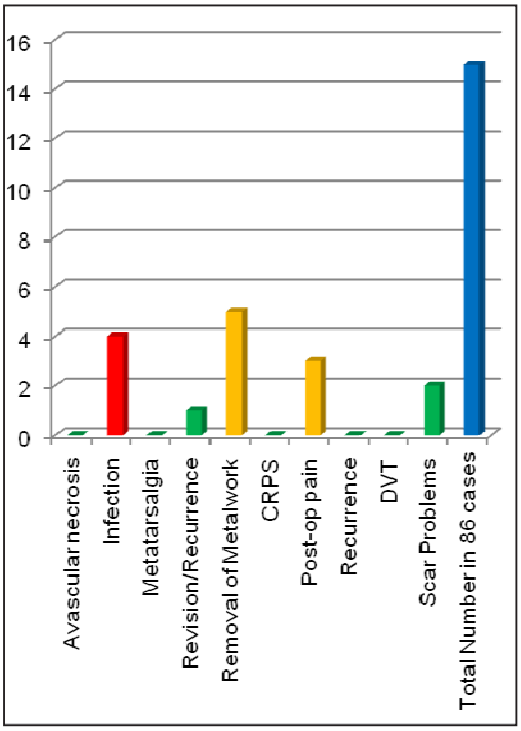

Figure 1. The MYHT rates for the 10 criteria

METHODOLOGY

A retrospective review of case notes was conducted on 86 sequential cases of Chevron Akin osteotomy, which were identified via clinical coding on the MYHT IT system. The 86 cases represent the whole population of patients undergoing Chevron Akin procedures over the 3-year period 2007- 2010. Gathering data from a whole population over a set time period is time consuming but has advantages over most sampling strategies; it allows for seasonal variation, provides a picture of the whole time period and is truly representative of the MYHT population. Colman & Pulford[20] state that professionals have a long history of reviewing case notes in order to reflect on their practice; this approach relies heavily on the motivation of individual clinicians. Clinical audit is a formalised process that can take many guises, of which reviewing case notes is one. Applying a rigorous audit methodology will reduce subjectivity and increase the reliability of the information gathered.[21]

Criterion Number	MYHT (86 cases)		PASCOM (10,274 cases)	
1. Avascular necrosis	0		3	0.03%
2. Infection suspected	4	4.65%	166	1.62%
3. Transfer metatarsalgia	0		127	1.24%
4. Revision rate (further surgery required)	1	1.16%	5 in 246 *	2.00%
5. Removed metalwork	5	5.81%	375	3.65%
6. Complex regional pain syndrome	0		15	0.15%
7. Severe post-operative pain	3	3.49%	167	1.63%
8. Recurrence /insufficient correction	0		150	1.46%
9. DVT	0		9	0.09%
10. Scar problems	2	2.33%	221	2.15%
TOTAL COMPLICATIONS	15	17.44%	1233	12.00%

* Data from Larholt *et al* [19] regarding revision surgery

Table 1. The MYHT rates for each of the 10 criteria benchmarked against national standards and complication rates held on the PASCOM system

The names of patients identified for inclusion in the audit were supplied by the IT department based on coding of the episode. Data were collected using an audit tool designed around the 10 surgical outcomes criteria identified in Table 1. The use of this audit tool provided a systematic methodology for gathering data.

The data were benchmarked against the best available PASCOM data and rates from published literature for all surgical procedures. One of the primary reasons for using PASCOM data for benchmarking the audit criteria was the similarity between surgical approaches and the volume of procedures and outcomes that have been reported. A total of 10,247 surgical episodes were reported via the PASCOM system between 1997 and 2009, which relate to all types of foot surgery performed by podiatric surgeons in the UK; 869 chevron osteotomies and over 3000 Akin procedures were recorded over this period.

STATISTICAL ANALYSIS OF CRITERIA 1–10

Simple quantitative data analysis is more commonly used in audit.[22] In the MYHT audit criteria 1–10, the samples compared are numerical, binomial data; the samples are also independent and the sample sizes are fixed in advance. The z-test for equality of two binomial proportions was selected for analysis.

This statistical test can aid the audit team in establishing whether there is equality between the results from two independent samples of different sizes. Each of the 10 audit criteria was tested for equivalence. It is important to acknowledge that, if a probability is extremely small or large, the z test becomes less accurate.[23]

RESULTS

All MYHT audit criteria were statistically equivalent to, or lower than national PASCOM rates using the z-test for equality of two binomial proportions, with the exception of criterion 2 (Infection rates) and criterion 5 (Removal of metalwork) which were marginally higher.

Criterion 2: Infection not equivalent to national PASCOM rate

There was a suspected infection rate of four in 86, which was higher than the national PASCOM rate, which prompted a further review of the notes. The term 'suspected' infection was used, when there were clinical signs of infection recorded in the notes, but not necessarily confirmed by a positive culture.

More detailed review of the patient notes showed that two of the four cases were found to be superficial skin infections (confirmed by positive swab) and two had negative swab reports where the early signs of inflammation may have be related to excessive weight bearing early in the post-operative recovery period. All suspected infections resolved within 7 days after treatment with 500mg Flucloxacillin qds orally. Therefore a 'proven' infection rate of two in 86 was identified, which is consistent with national findings. There were no cases of osteomyelitis.

Criterion 5: Removal of metalwork, equivalent to national PASCOM rate but highest MYHT complication

Removal of metalwork was evidenced in five of 86 cases. The notes were further interrogated and it was found that all five were Akin screws. Although statistically equivalent to national data, it was felt that a change in operative technique could reduce this number further. All other audit criteria were statistically equal to national PASCOM levels.

Incidental audit findings

Two patients had prolonged post-operative swelling limiting footwear choice. Prolonged swelling will be included in future audit criteria.

Audit recommendations

- Adopt PASCOM fully and incorporate Patient Recorded Outcome Measures (PROMs).
- Continue to record data electronically.
- Review procedure specific data on an annual basis via PASCOM database and modify practice in line with findings.
- Review patient outcome data on an annual basis to increase knowledge base and compare with national figures as a governance exercise.
- Investigate ways to improve PASCOM data access as currently unable to access procedure-specific national data freely.

An audit action plan is outlined in Table 2.

DISCUSSION

A review of the literature revealed that complication rates generally within podiatric surgery are low and so it is difficult to identify statistical significance between studies without large population samples.[25] It is important to remember that statistical equality and clinical equality may be very different. For example, an infection rate of 3 in 100 and 6 in 100 may be statistically equal when a z-test is used to compare samples, however one population is twice as likely to develop an infection as the other, which is a clinically significant difference and requires investigation.

Limitations of audit

PASCOM data access

Unfortunately, due to funding issues, the audit team was unable to access national procedure specific data so a direct comparison for the Chevron Akin procedure was not possible. Instead, MYHT Chevron Akin data were compared against complication rates for all surgical procedures from the available PASCOM data set.

Methodology – retrospective review of notes

A retrospective audit of notes for surgical outcomes is heavily reliant on correct entries being made in the patient record. For example, if subjective patient comments such as *'the first 24 hours after the operation were agony but it's settled now'* are not recorded in the nursing notes at the first

Task	Person Responsible	Date to be completed
National data access issue raised with the professional body that holds the data. A request that national statistics from PASCOM are released annually for comparison has been made.	Mr J Pickard	Complete
Ensure PASCOM data are collected and entered into the system in a timely manner.	Mr J Pickard	April 2013
Introduce PROMS to the audit process and consider . the validity of the pre-operative MANOX data	Mr J Pickard	April 2013
Re audit service.	Mr J Pickard	April 2013

Table 2. Audit action plan

redressing appointment at one week, then there is a high likelihood that poor post-operative pain management is not accurately recorded on the audit tool and, as a consequence, underreported in the findings of the audit. A prospective audit has an advantage over retrospective audit, as it can be completed during the patient journey, and both positive and negative outcomes can be recorded, reducing the likelihood of missing data. There may be cases where notes are missing or sections are missing from the notes, leading to incomplete data collection and poorer validity of the retrospective audit findings.

No PROMS in the audit criteria

Again, due to the retrospective nature of the audit, Patient Reported Outcome Measures (PROMS) were not included in the audit criteria. PROMS are a powerful tool and give an insight into patient experiences of pain and foot function, in addition to overall satisfaction. Future MYHT audits via the online PASCOM-10 system will utilise PROMS such as the Manchester Oxford Foot Questionnaire (MANOX) [24] and the PASCOM Patient Satisfaction Questionnaire (PSQ10).

CONCLUSION

No patients undergoing the Chevron Akin procedure developed long-term complications, as recorded in the patient notes, although a planned patient satisfaction audit using a validated audit tool for HV surgery such as the Manchester Oxford Foot Questionnaire [24] will be used in future audits to explore patient satisfaction further.

The Chevron Akin technique, as performed in MYHT, is a safe, effective technique for the correction of HAV deformity. There were no cases of AVN in 86 reviewed notes, which may add to the body of evidence supporting the low risk of AVN, contradicting Meire's often quoted research.[26]

POLICY CONTEXT

The MYHT podiatric surgery division now has information on the outcomes of its Chevron Akin procedures, and MYHT audit information can be seen as a 'Hallmark of Quality'.[27] Patients and commissioners can now be provided with reliable evidence to the safety and effectiveness of this type of HV surgery. The importance of auditing outcomes of podiatric surgical techniques has been highlighted, and audit information will be gathered prospectively via the PASCOM system for all procedures performed by the consultant podiatric surgeon in MYHT.

REFERENCES

1. Banks, A, Downey, MS, Martin, DE, Miller, SJ. McGlamry's *Comprehensive Textbook of Foot and Ankle Surgery*, Vol 2, 3rd Edn. Philadelphia: Lippincott, Williams and Wilkins, 2001.
2. Kilmartin, TE. Revision of failed foot surgery: a critical analysis. *The Journal of Foot and Ankle Surgery* 2002; **41**(5): 309-315.
3. Kilmartin, TE. Critical Review: the surgical management of hallux valgus. *British Journal of Podiatry* 2006; 9(1): 4-24.
4. Mann, R, Coughlin, M. Hallux valgus - etiology, anatomy, treatment and surgical considerations. *Clinical Orthopaedics and Related Research* 1981; **157**: 31-41.
5. Brosky, T, Menke C, *et al*. Reconstruction of the first metatarsophalangeal joint following post-cheilectomy avascular necrosis of the first metatarsal head: A Case Report. *The Journal of Foot and Ankle Surgery* 2009; **48**(1): 61-69.
6. Society of Chiropodists and Podiatrists PASCOM Outcomes Data (unpublished). Circulated to Fellows of the Faculty of Podiatric Surgery, 2009.
7. Maher, A J, Metcalfe, S A. A report of UK experience in 917 cases of day care foot surgery using a validated outcome tool. *The Foot* 2009; **19**: 101-106.
8. Ferrari, J, Higgins, J P, Prior, T. Interventions for treating hallux valgus (abductovalgus) and bunions. *Cochrane Database, Systematic Review*. 2004.
9. Rudge, G. PASCOM data collection system & NHS IT strategy. *Podiatry Now* 2008; April: 38-39.
10. Vernon, D W, Campbell, J, Potter, M. A research strategy for podiatry. *British Journal of Podiatry* 2003; **6**(4): 100-102.
11. Miller. S, Croce, W A. The Austin procedure for surgical correction of hallux abducto valgus. *Journal of the American Podiatry Association* 1979; **69**: 110-118.
12. Austin, D W, Leventen, E O. A new osteotomy for hallux valgus. *Clinical Orthopaedic Related Research* 1981; **157**: 25-30.
13. Donnelly, R, Saltzman, C, Todd, K, Johnson, K. Modified Chevron osteotomy for hallux valgus. *Foot and Ankle International* 1994; **15**(12): 642-645.
14. Green, M, Avascular Necrosis following distal chevron osteotomy of the first metatarsal. *Journal of Foot and Ankle Surgery* 1993; **32**(6): 617-621.
15. Jones, K, Feiwell, L, Freedman, E, Cracchiolo, A, The effect of chevron osteotomy with lateral capsular release on the blood supply to the first metatarsal head. *The Journal of Bone and Joint Surgery* 1995; **77**(2): 197-204.
16. Akin, O F. The treatment of hallux valgus – a new operative procedure and its results. *Medical Sentinal* 1925; **33:** 678-679.
17. Banks, A. Avascular necrosis of the first metatarsal head: a different perspective. *Journal of American Podiatric Medicine Association* 1999; **89**(9): 441-453.
18. Plattner, P F, Van Manen, J W. Results of akin type proximal phalangeal osteotomy for correction of hallux valgus deformity. *Orthopaedics* 1990; **13**(9): 989-996.
19. Larholt, J. Rees, S. Tagoe, M. A complication audit following foot surgery. *Podiatry Now* 2008; July: 14-20.
20. Colman, A M, Pulford, B D. *A Crash Course in SPSS*, 4th Edn. Chichester: Wiley Blackwell, 2008.
21. Benjamin, A. Audit: How to do it in practice, *British Medical Journal*, 2008 **336**:1241-1245.
22. Paxton, R, Whitty, P, Lothian, J. Research, audit and quality improvement. *International Journal of Health Care* 2006; **19**(1): 105-111.
23. Hildebrand, D K, Lyman, O, Gray, J B. *Basic Statistical Ideas for Managers*, 2nd Edn. California: Belmont, Thomson Brooks/Cole, 2005.
24. Dawson, J. Coffey, J, Doll, H, Lavis, G, Cooke, P, Heron, M. Jenkinson, C. A patient-based questionnaire to assess outcomes of foot surgery: Validation in the context of surgery for hallux valgus. *Quality of Life Research* 2006; **15**: 1211-1222.
25. Rudge, G, Tollafield, D. A critical assessment of a new evaluation tool for podiatric surgical outcome analysis. *British Journal of Podiatry* 2003; **6**(4): 109-119.
26. Meirer, P J, Kenzora, J E. The risks and benefits of distal first metatarsal osteotomies. *Foot & Ankle* 1985; **6**(1): 7-17.
27. National Institute of Clinical Excellence, Commission for Health Improvement, Royal College of Nursing and The University of Leicester, *Principles for Best Practice in Clinical Audit*. Oxon: Radcliffe Medical Press, 2002.