

# Outcomes In the comparison of the Stainsby Procedure versus Weil Metatarsal Osteotomy in Patients with Metatarsalgia/Forefoot Deformity

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## Statement of Purpose:

There is an abundance of studies which advocate for the use of the Weil metatarsal osteotomy as the standard of treatment for the chief complaint of metatarsalgia. The Stainsby procedure, which was initially described in 1997, has gained popularity in the UK as an alternative surgical procedure with good outcomes for this condition. The purpose of our study is to compare the outcomes of the weil osteotomy with the observed outcomes in our practice with the Stainsby procedure for surgical management of severe hammertoe deformity and metatarsalgia.

## Background :

The Stainsby procedure, which was described in 1997, has gained popularity in the UK as an alternative surgical procedure with good outcomes for the treatment of metatarsalgia and hammer digit deformity. The procedure itself has undergone modifications since its initial introduction by Stainsby, but the general principals are the same. An incision is made at the dorsal aspect of the MTPJ and dissection is carried down to the level of the MTPJ. The EDL is fully transected at the neck of the metatarsal and reflected distally. The proximal 1/3 of the proximal phalanx is then resected from the phalanx. A McGlamry elevator is used to free soft tissue from the head of the metatarsal and reposition plantarly into its proper position. The distal stump of the EDL tendon is then sutured into the FDL tendon within the plantar aspect of the MTPJ, and can be further secured with a k-wire through the head of the MT.

This procedure specifically maintains the length of the metatarsal while alleviating symptoms of the associated deformity. The displaced plantar plate results in metatarsal head depression in the claw toe deformity.<sup>13</sup> By surgically correcting the deforming force and inserting the plantar plate and fat pad to their original positions beneath the metatarsal head, there is an alleviation in many of the symptomatic metatarsalgia type complaints these patients present with and suffer from.

## Methodology:

- Search strategy for Clinical Data Collection at Foot and Ankle Inst.
  - Single center retrospective review performed and we identified patients who underwent the Stainsby procedure with necessary adjunctive procedures for correction of painful hammertoe deformities and metatarsalgia from October 2017 to November 2020
  - Nine patients were included in this study with a minimum follow-up of 6 months. Patient demographics, pre-op pain assessment, pre-operative lachman test, adjunctive procedures, post-operative pain assessment, post-operative lachman's test, recurrence and complications and follow-up time were evaluated
  - Patients will be identified via manual medical record review at Foot & Ankle Associates, LTD. Patients will be identified if they match ICD-10 codes for hammer digit deformities and/or capsulitis (M20.41, M20.42, M77.52, M77.51)
  - Capsulitis diagnosis was included in this study as it is one of several MTPJ ailments collectively called metatarsalgia.
- Search Strategy for Literature Review:
  - Relevant publications were identified by electronically searching the PUBMED database in July 2020
  - Search strategy: metatarsalgia, 2nd or second metatarsophalangeal joint
  - Studies that used the terms "modified stainsby", "stainsby procedure", "weil metatarsal osteotomy", "metatarsalgia", and "hammertoe deformity"
  - Articles were reviewed for inclusion/ exclusion by three authors (AD,RC,DR, RB)
- Inclusion:
  - Clinical studies that included Stainsby procedure and Weil metatarsal osteotomy for the correction of lesser toe deformities/metatarsalgia
  - Studies that had a pre-op scoring system and a post-op scoring system to determine the success/outcome of the procedure that was done
  - Studies that had treatment in patients and follow-up times included
  - Articles published in English language
  - minimum follow-up of 6 months
- Exclusion:
  - Article date of publication was greater than 30 years old
  - Cadaveric studies
  - Studies evaluating patients under age 18 years
  - Studies with level of evidence 5 or a case study

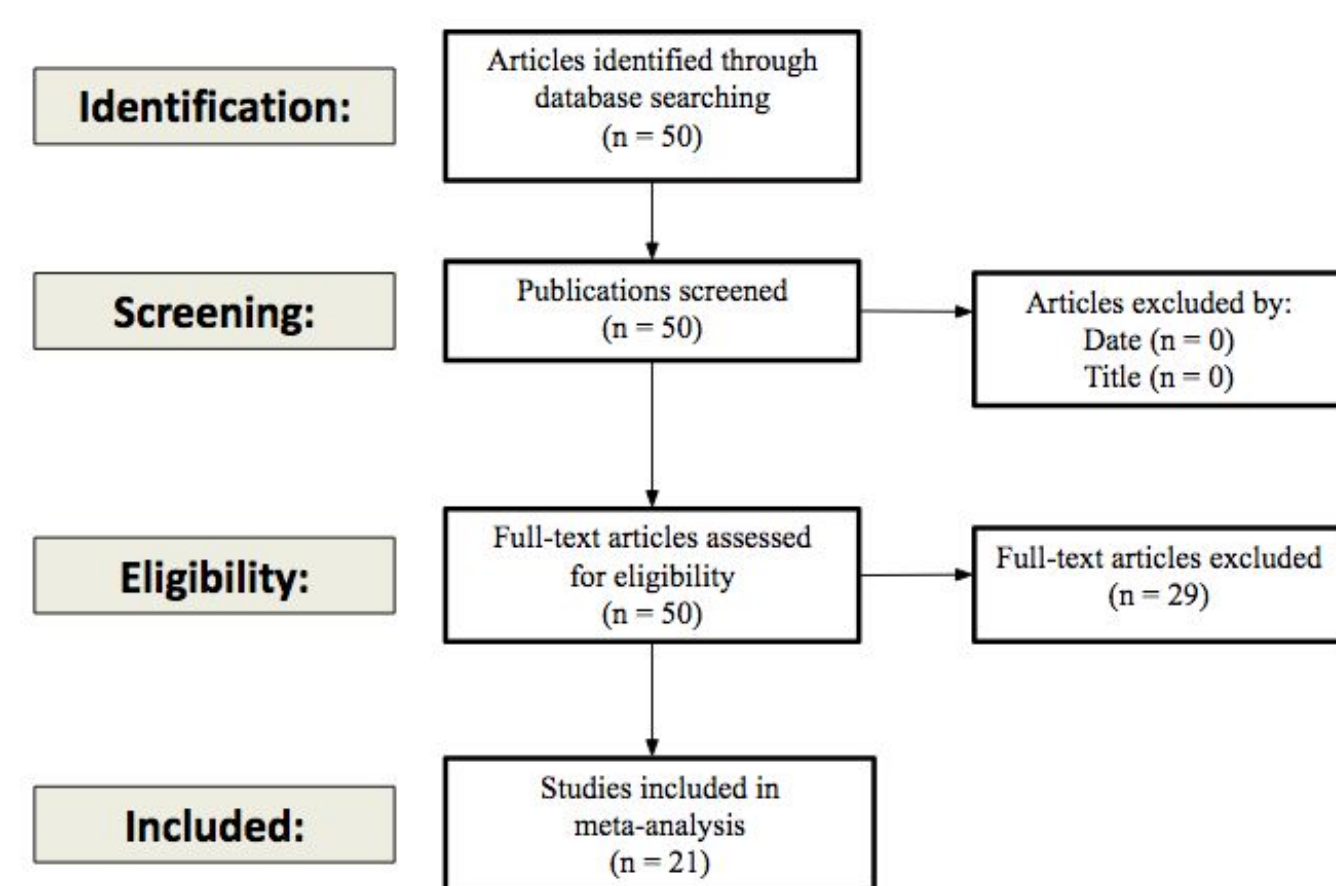


Figure 1. Flow chart diagram of article selection process

## Results:

- Clinical patient results
  - Patients on average reported a 75% reduction in pain at final follow-up
  - 100% correction in digital deformity and plantar plate tear at final follow-up
  - Complications:
    - No infections of any type reported
    - One incident of surgical site dehiscence reported which resolved at 6 weeks
    - One patient had 2nd digit amputation at 8 weeks post op due to gangrene resulting from an ischemic injury
- Weil postoperative results
  - 78.6% of patients reported no metatarsalgia
  - On average patients experienced a 5.5 point decrease on VAS for pain scoring
  - On average patients reported an increase of 38.6 points on the AOFAS Forefoot scale
- Weil postoperative complications
  - Floating toe complication occurred in 16.8% of patient digits that underwent a Weil osteotomy at the corresponding MT
  - 21.4% of patients had recurrence of metatarsalgia
  - 10.9% developed transfer metatarsalgia
  - Boney union complication was seen in 2.4% of patients
  - AVN was seen in 0.4% of patients
- Stainsby postoperative results
  - 84.1% of patients reported no metatarsalgia
  - 67.6% reported no plantar callosities
  - 72.15% reported elimination of moderate/severe pain
  - On average patients reported an increase of 37.6 points on the AOFAS Forefoot scale
  - 81.7% of patients reported excellent/good results
- Stainsby postoperative complications
  - 15.9% patients had recurrence of metatarsalgia
  - Recurrence of hammer digit deformity occurred in 7.5% of patients
  - No reported boney union or AVN complications

Clinical Patient Findings	Totals
Total # of Pt's	9
Total # of feet	10
Total # of Stainsby's procedures performed	15
Average follow-up (mo)	9.1
Preoperative (+) Lachman's test at 2nd MTPJ	9
Postoperative (+) Lachman's test at 2nd MTPJ	0
Preoperative toe deformity	15
Recurrence of toe deformity	0
Preoperative Pain (VAS)	6.4
Postoperative Pain (VAS)	1.6

Table 1. Table of Metatarsal Osteotomy article review findings, including recurrence of deformity and pre/postoperative AOFAS scores

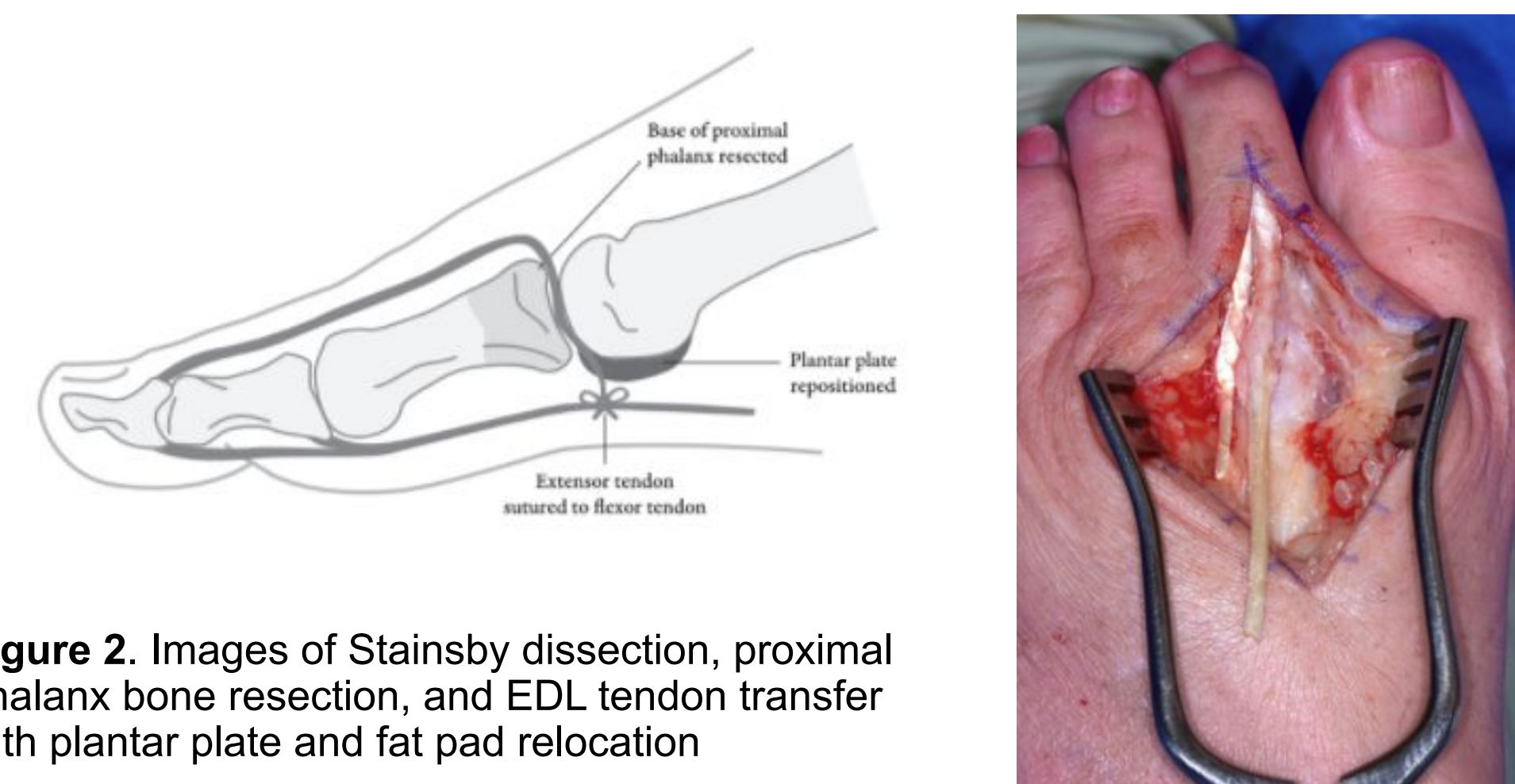


Figure 2. Images of Stainsby dissection, proximal phalanx bone resection, and EDL tendon transfer with plantar plate and fat pad relocation

## Results Continued:

Weil Osteotomy Data	# of patients	# of feet operated on	# of Weil Osteotomies performed	Average Follow-up (mo)	Preop VAS score	Post Op VAS score	Preop AOFAS Forefoot score	Post Op AOFAS Forefoot score
Johansen	30	30	45	12.5	N/A	N/A	N/A	N/A
Eng Meng Yeo	20	20	41	6	4	0	62	86
Fleischer	86	86	86	12	N/A	N/A	N/A	N/A
Godoy - Santos	28	28	N/A	12	N/A	N/A	38.96	95.53
Perez - Munoz	76	93	314	25.7	N/A	N/A	N/A	90
Nery	28	28	55	17	8	1	52	92
Garcia Fernandez	92	97	106	48.9	N/A	N/A	N/A	72.55
Bevernage	23	25	43	37.4	N/A	N/A	45.9	93.5
Highlander	503	576	1131	25.8	N/A	N/A	N/A	N/A
Khurana	61	86	189	31	N/A	N/A	42	79
Weil Jr.	13	15	15	22.5	7.3	1.8	N/A	85.7
Total:	960	1084	2025	22.8	6.43	0.93	48.17	86.78

Table 2. Table of Weil metatarsal osteotomy literature review data

Weil Osteotomy Post Op Results	Pre-op Metatarsalgia	Post-op Metatarsalgia	Transfer Metatarsalgia	Floating Toe	Delayed union, malunion, non-union	AVN
Johansen	N/A	N/A	N/A	2	N/A	N/A
Eng Meng Yeo	20	0	N/A	0	N/A	N/A
Fleischer	86	N/A	N/A	0	N/A	N/A
Godoy - Santos	28	0	2	0	N/A	N/A
Perez - Munoz	76	21	N/A	8	N/A	N/A
Nery	55	N/A	N/A	15	N/A	N/A
Garcia Fernandez	97	44	28	37	5	3
Bevernage	23	0	1	13	N/A	N/A
Highlander	576	118	55	253	13	0
Khurana	54	6	0	12	0	0
Weil Jr.	15	1	0	0	0	0
Total:	1030	190	86	340	18	3

Table 3. Table of Weil metatarsal osteotomy postoperative results

Stainsby Articles	# of patients	# of feet operated on	# of Stainsby's performed	Average Follow-up (mo)	# of patients with RA	Moderate to Severe pain preop	Moderate to Severe pain post op	Patient Satisfaction
Concannon	37	42	92	17	5	32	8	26
Queally	11	13	43	16	13	13	1	10
Matthews	75	84	123	45	17	83	14	68
Dodd	15	15	23	14	4	N/A	N/A	N/A
Briggs Stainsby	81	110	211	59	16	109	17	95
Mangalshkar	23	30	71	23	18	26	4	16
S. Hossain	32	38	88	37	0	28	0	23
Edward James Bass	12	13	51	12	12	N/A	N/A	N/A
Hassan	74	94	135	32	48	89	19	34
Total:	360	439	837	28.3	133	380	63	272

Table 4. Table of Stainsby literature review data

Stainsby Post Op Results	Pre-op Metatarsalgia	Post-op Metatarsalgia	Pre-op callus formation	Post-op callus recurrence	Pre-op claw toe deformity	Post-op claw toe recurrence
Queally	13	1	13	1	43	0
Matthews	N/A	N/A	46	14	123	3
Dodd	N/A	N/A	32	8	N/A	N/A
Briggs Stainsby	69	11	N/A	N/A	69	12
S. Hossain	N/A	N/A	N/A	N/A	88	12
Hassan	94	16	76	31	135	7
Total:	176	28	167	54	458	34
% Decrease:		84.1		67.6		92.5

Table 5. Table of Stainsby postoperative results

## Discussion:

Over the years, the Weil Osteotomy procedure has gained a tremendous amount of popularity in regards to the treatment of metatarsalgia and forefoot deformities. However, this specific procedure has been associated with high rates of complications, especially that of recurrent metatarsalgia and post-operative floating toe. We sought to prove there was more than one type of procedure that could produce excellent results with decreased rate of complications for these forefoot deformities. This study specifically seeks to compare the surgical outcomes of the Weil osteotomy procedure versus the Stainsby procedure for the treatment of metatarsalgia and forefoot deformities. Upon review of our results, we have concluded that the Stainsby procedure has a 5% less chance of metatarsalgia recurrence compared to the Weil procedure. The Weil procedure demonstrated a postoperative floating toe rate of 16.8% while the Stainsby procedure demonstrated a 7.5% rate of postoperative hammer digit deformity recurrence. It was also concluded that both procedures reduce pain and improve overall functionality with an increase in AOFAS scores by 37.6-38.6% on average. Lastly, our data reveals that the Stainsby procedure showed no incidence of bony union complications or AVN, while the Weil Osteotomy procedure produced a bony union complication in 2.4% and an AVN in 0.4% of patients.

After review of the postoperative outcomes of the Stainsby procedure performed at the Foot and Ankle Institute, there was noted to be a similarity in results compared to our literature review. On average, patients reported a 75% reduction in pain on VAS scores from preoperatively to their final postoperative visit. Our specific patient population demonstrated 100% correction of the deformity with no reported recurrence or complications at the final follow up visit. Our particular study faced several limitations. One limitation was our small sample size, producing a limited amount of data collected. Our study also had a relatively short postoperative follow-up with an average of about 9.1 months.

Our study shows comparable surgical outcomes with a decrease in postoperative complications with utilization of the Stainsby procedure. We encourage future studies to compare the surgical outcomes and postoperative complications in their own practice when utilizing these two procedures. We also advocate for the usage of the Stainsby approach for correction of such forefoot deformities and reduction of metatarsalgia type pain.

## Conclusion:

Our data and literature review showed that patients who underwent the Stainsby procedure for primary deformity correction with adjunctive procedures had comparable functional outcomes to the Weil osteotomy. Additionally there is evidence of a lesser complication profile with the Stainsby procedure versus the Weil osteotomy. Future studies will be performed and longer follow up times are needed for our patient collected data in order to further strengthen our results, however, these results were comparable to our Stainsby literature review.

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