



Midfoot Arthritis: Lateral Column Considerations

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Disclosures

- I have no disclosures.
- Any industry pictures/names used in this presentation are taken for representation purposes without bias.



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Roadmap



- Anatomy
- Etiology of Pathology
- Evaluation
- Treatment
 - Lite<mark>ratu</mark>re
- Review

Abbreviation Key:

- TMT = tarsometatarsal
 - LC = lateral column
 - AD = arthrodesis
 - AP = arthroplasty



Author. Journal, Year. PMID#

Why Are We Talking About This? 🕯

- Midfoot injuries (LisFranc) discussed widely in the literature
- Little consideration to lateral column pathology in midfoot injuries, arthritis, sequela:
 - McGlamry's 4th Edition (2013)
 - Chapter 82: 4 pages (2 are full-figures); 5 references
 - Mann's 9th Edition (2014)
 - Chapter 20: 5 pages on MF-AD, 2 paragraphs on LC-consideration
- How do we (do we?) diagnose, work up, and treat lateral column pathology?
 - We probably do not do many isolated lateral column fusions;
 - What do we do with the lateral column w TMT/LC-OA/PTA, etc, when treating the 1-3 (vs.) 4-5 TMT?
 - Do we work it up?
 - Do we forget about it?
 - Do we only focus on the 1-3 TMT?



CRH





Medial / Middle Column

- Medial Column
 - 1M/Medial Cuneiform/Navicular
 - $-\Sigma^{\sim}$ 6–8-mm excursion in DFX/PFX
- Middle Column
 - 2/3–MT / Intermediate & Lateral Cuneiform
 - 2/ICJ Least amount of motion,
 - < 4° sagittal plane^

	Sagittal plane	Frontal plane		
1 st	3.5 mm	1.5 mm		
2 nd	0.6 mm	1.2 mm		
3rd	1.6 mm	2.6 mm		
4^{th}	9.6 mm	11.1 mm		
5 th	10.2 mm	9.0 mm		



Lateral Column





- Calcaneus
- 10° motion in both:
 - DFX/PFX*
 - Pronation /Supination^
- Literature cites:^{&\$}
 - Triplane motion at LC
 - Frontal/Sagittal motion is 2-3x that of med/mid columns
- Mobility of joint / column is fundamental to foot:
 - function;
 - shock absorption (stress/load accommodation & trasnfer);
 - mobile adaptor;
 - rigid level for toe-off





The Lateral Column

- "The motion of the lateral column is <u>important for optimum function</u>. Therefore, whenever possible, we recommend that the lateral column <u>not be included in the arthrodesis</u>, particularly as <u>most of these joints are asymptomatic</u> despite radiographic evidence of osteoarthritis"
 - Komenda GA. JBJSam, 1996. 8934480
- "The author's clinical impression [and retrospective review demonstrated] that fusion of the lateral rays was <u>not needed for a result</u>"
 - Sangeorzan BJ. FAI, 1990. 2307374
- "Mobility of these joints plays a <u>key role in handling overloads</u> that occur during radical changes in foot position or high loads."
 - Lakin RC. JBJS, 2001. 11315780
- "Lateral midfoot motion <u>should be preserved</u> if not affected by painful arthrosis, and in general the metatarsocuboid joints <u>infrequently require arthrodesis</u>"
 - Thordarson DB. Foot and Ankle, ed 1, 2004.
- "Inclusion of these articulations is *not recommended* for routine tarsometatarsal arthrodesis,"
 - Raikin SM. FAI, 2003. 12956562

OOT & ANK

- "...<u>no difference in outcome</u> was seen between patients with fusion of the medial column and those with fusion of the whole tarsometatarsal joint."
 - Rammelt S. JBJS^{br}, 2008. 18978273
- "As a general rule, the fourth and fifth metatarsocuboid articulations seem to be somewhat <u>more</u> <u>forgiving</u> and tend to be <u>less symptomatic</u> than the medial three MTC joints, due to "<u>more</u> <u>flexibility</u> exists in the two lateral rays than in the medial three rays"

Coetzee JC. Mann's 9th, 2014. Chapter 20



Biomechanical Considerations of the Lateral Column

- Problems w/ Fusion (stiffness & 个P° w/ motion)
 - lateral column overload;
 - local bone pain;
 - non-union;
 - stress fractures;
 - transfer pain / metatarsalgia (CCJ; MTPJ);*~
 - Development of rigid lateral midfoot prominence*
- The result of LC-AD are a pain-free area that feels very stiff and uncomfortable.^~



*Raikin SM. FAI, 2003. 12956562 ^Chang TM. McGlamry 4th, Ch 82. ~Koenis MJJ. FAS, 2015. 25682411



In Practice



- Komenda et al.
 - 32 pt retro review; 2 LC-AD inclusion w TMT-AD
 - Both developed metatarsalgia \rightarrow MT-dfx osteotomy;
 - Patients complain of stiff foot.
- Sangeorzan et al.
 - 16 pts MF-AD; 4 LC-AD inclusion w 1-3TMT-AD
 - (+) LC-AD = no demonstrable outcome difference;
 - Authors felt that it was not desirable to perform a LC-AD.
- Mann et al.
 - 40 pt retro review; 8 LC-AD inclusion w TMT-AD
 - No formal difference;
 - Authors conclude fusion left pts w very stiff, but tolerated foot.









Arthrodesis of the 4th & 5th tmtj of the midfoot

• Purpose:

- Reluctance of surgeons to fuse the lateral column due to mechanics leaves patients w unresolved issue.
- Methods:
 - − n = 28 feet (22 CN; 6 painful-OA) \rightarrow
 - Isolated LC-AD w screw fx
- Results:
 - AOFAS = $45 \rightarrow 87.6$
 - VAS = 8.2 → 2.4 (↑71%)
 - Funct. Incapacity = 7.0 → 1.2 (↑83%)
 - Comp = lat foot stiffness, prominent LC, sfx (not ÷'d)
- Conclusions:
 - "Inclusion of these articulations is not recommended for routine tarsometatarsal arthrodesis"
 - "Can and should be included for patients with...
 - "uncorrectable lateral midfoot collapse and rockerbottom foot deformity
 - "painful arthritis involving these articulations has been resistant to adequate nonoperative management.









Raikin SM. FAI, 2003. 12956562

ETIOLOGY OF PATHOLOGY



Midfoot Pain / Arthritis

- Traumatic arthritis / LisFranc (MC Etiology)
 - Articular cartilage damage
 - Joint displacement with medial arch collapse
 - Persistent joint malalignment
- DJD / functional breakdown
- Charcot Neuroarthropathy / breakdown
- Cuboid syndrome
- PTTD with long medial arch collapse
- Inter-cuneiform instability
- Inflammatory arthritis



Lateral Column Pain





MISC

- Foot Types
 - Neutral to slight supinated
- Hindfoot varus
 - MF/FF compensate by FFabd → LC overload
- s/p Triple-Pantalar
 - Varus malunion
- Plantar fasciotomy*
 - Greater release, greater pain potential > 50%

Berlet GC. FAI, 2002. 12043990 *Brugh AM. JFAS, 2002. 12500787

EVALUATION





Chief Complaint



Chronic / Arthritis

- Symptomatic with activity, specifically ones with heel rise (stairs)
- Loss of arch height (loss of midfoot stability) or flat foot
- Abductory forefoot
- Lateral impingement
- Bony prominences and shoe-gear pain





Patel, A. JAAOS, 2010. 20595134

Physical Examination

General

- Exostosis dorsally
 - Neuritis (SPN/DPN across exostosis)
- Instability/Hypermobility with ROM
- Flatfoot
- Equinus
- Skin changes
 - Dorsal irritation
 - Plantar callus



Tests

- Joint Palpation (isolated)
 - − REMEMBER \rightarrow 2M/MC recessed
- Piano Key Test
 - Isolated dfx/pfx MT @ head
- Stress Abduction^
 - Pronate/abd FF on MF
- Heel Rise (provocative)
- Injection Therapy:
 - Intra-articular (joint arthrosis) [vs.]
 Extra-articular (impingement exostosis, neuritis)*
 Specific column involved

*Berlet GC. FAI, 2002. 12043990 Patel, A. JAAOS, 2010. 20595134 Desmond EA. FAI, 2006. 16919225 ^Komenda GA. JBJS^{am}, 1996. 8934480

Imaging



- Radiographs
 - TMT joint space loss,
 - Peri-articular lipping
 - Subchondral sclerosis
 - Dorsal spur
 - Lateral Meary's fault
 - Forefoot abduction
- MRI
 - Cartilage wear, subchondral marrow edema, cyst presentation
- CT
 - Greater osseous detail and cyst formation
- Bone Scan
 - Increased signal in region of bone turnover or blood flow secondary to arthritic inflammation





Patel A. JAAOS, 2010. 20595134



Intra-Articular Injections (diagnostic and therapeutic)



• 4/5-TMT injection under fluoro (LA/steroid)

 \rightarrow near or complete pain relief 1.5^x-mths* (n = 5)

- Injections are not "accurate" & unnecessary."~
 - Palpation/needle placement = Non-arthritic 1st (21%) and 2nd (28%) success rate⁺
 - US guidance/needle placement = 1^{st} (70%) / 2^{nd} (57%)⁺
 - 20% fluid-leak rate to the adjacent MC joints.
- Mixed results with diagnostic block predicting overall surgical-AP outcome.*^







Putting It All Together



Injection

- Berlet et al
 - "Patient is NOT considered a candidate for a LC-MF procedure unless significant pain relief is obtained by a differential injection."*
 (25g/fluoroscopy, 4-5/TMT)



Imaging

- Sangeorzan et al; Komenda et al; Raikin et al
 - Studies have noted many patients w XR evidence of LC-DJD but min/no lateral midfoot pain.
- Brunet et al
 - PTA changes to the midfoot on XR have little relationship to functional impairment.
- Komenda et al; Berlet et al
 - Bone scans frequently show increased LC uptake w/o corresponding clinical symptoms.

Berlet GC. FAI, 2002. 12043990 Raikin SM. FAI, 2003. 12956562 Brunet JA. JBJS^{br}, 1987. 3108261 Sangeorzan BJ. FAI, 1990. 2307374 Komenda GA. JBJS^{am}, 1996. 8934480



TREATMENT (LITERATURE)



Conservative Treatment – Midfoot Arthritis

<u>Modality</u>	<u>Example(s)</u>
Local Therapies	Activity modification
	• Ice
	• Heat
	Physical therapy / gastrocnemius stretching
Oral Medications	NSAIDs
	Corticosteroids
Topical Medications	NSAIDs
	Topical corticosteroids
	Local anesthetics
Injection Therapy	Corticosteroid
	 Viscosupplementation
Shoegear Modifications	Custom molded orthotics
	• Carbon fiber spring plate (stiffening devices)
	Rockerbottom shoe
	Shoelace modifications
	• Bracing (AFO)



Planning and Expectations



- Surgeon:
 - Procedures include: simple exostectomy, arthroplasty, arthrodesis insitu, and arthrodesis with deformity correction.
 - No classification exists to describe the symptoms, XR findings, or recommend surgical procedures for a defined grade of deformity of midfoot arthritis.
 - Much of the judgment in appropriate procedure selection is based on the surgeon's clinical decision making, relying on both a physical exam and plain XRs as the guide.~
- Patient:
 - Surgery is often reserved for intractable pain or deformity that is not relieved with the aforementioned conservative measures.
 - Recommendations have been made for surgical intervention after a period of three to six months of continued pain after implementing conservative treatments as mentioned.~
 - Patient expectations should be set in that they still may have a stiff foot, limited gait, and only approximately 60% of total pain relief.*



*Patel A. JAAOS, 2010. 20595134 ~Komenda GA. JBJS^{am}, 1996. 8934480

Treatment Algorithm For Midfoot Arthritis



Lateral Column Surgical Options

- 4th & 5th TMT joint resection arthroplasty (w/wo interposition)
- Lateral column arthrodesis (less favorable)



Thordarson DB. Foot and Ankle, e1. 2004

Incision Placement Technique

- <u>2 Incision Technique</u>

 (1) 1st-2nd/TMTJ First IM Space
 (2) Lateral TMTJ Forth IM Space
- <u>3 Incision Technique</u>

 (1) 1st/TMT Dorsal/DM 1st Met
 (2) 2nd-3rd/TMT Second IM Space or dorsal to 3rd Met base
 (3) 4th-5th/TMT – Fourth IM Space
- Other Techniques

(1) 1TMT/Nav Joint – Over 1st Met
(2)3rd-4th TMTJ – Third IM Space
(3) 5th/Cuboid Joint – Over 5th Met







Berlet et al (2006)



Tendon arthroplasty for basal fourth and fifth metatarsal arthritis

- Purpose:
 - No studies outside of LC-AD in the literature
 - New (1st) technique description (LC-AP) w patient rvw
- Methods:
 - n = 8 (LisF⁶, 5-MT base fx³, 1°DJD², Inflm DJD); 25-mth f/u
 - Tech =
 - Jt debride to SCB; 1-cm gap; preserve med/lat/plantar capsule
 - Peroneus tertius or EDL-4th anchovy, KW-fixation
 - 0-6wk NWB \rightarrow 6wks KW-HWR/WBAT CAM x4wks \rightarrow shoe
- Results:
 - AOFAS = 64.5 / Dysf 个 10% / VAS 个 35%
 - Comps. = sural neuritis, edema, painful HW, pain
- Conclusions:
 - LC-AP is effective salvage procedure after (1) non-op tx fails and (2) joint confirmed by differential injection under fluoroscopy.
 - No complication was associated w coronal/sagittal instability









Shawen et al (2007)



Spherical ceramic interpositional arthroplasty for basal fourth and fifth metatarsal arthritis

- Purpose:
 - New technique description w patient rvw
- Methods:
 - n = 13 ; 11-mth f/u (34-mth^x)
 - Failed resection-AP \rightarrow salvage ceramic ball interposition
 - Tech =
 - Burr hole central joint; cortical rim w plantar lig spared
 - Ceramic spherical implant (WMT)
- Results:
 - − AOFAS (Post-Op) = \uparrow 87% improvement (28 \rightarrow 53)
 - − VAS = \uparrow 42% improvement (89 \rightarrow 52 per 100-mm scale)
 - No implant dislocations; one subsidence
- Conclusions:
 - Interpositional arthroplasty effective salvage option for lateral column arthrosis

 Can be performed in isolation in singular or dual joint pathology
 NEUHAUS FOOT & ANKLE
 Shawen SB. FAI, 2007. 17697654







Chang et al (2014) Lateral column arthroplasty

Technique Description:

- Resection
 - 4/5-MT <u>articular</u> base 0.5-cm resection, flat-cut
 - Leave cuboid articular surface intact
 - Preserve plantar/med ligs
- Space Maintenance
 - KW x6 wks
 - Biological spacer
 - Spherical implant
- Post-Op
 - 0-2/3-wks NWB
 - Trans CAM \rightarrow Sneaker



Chang TM. McGlamry 4th. Ch 82



Koenis et al (2015)



Simple resection arthroplasty for treatment of 4th & 5th tmtj problems. A technical tip and a small case series.

Patient characteristics						Outcome		
Gender	Age	Diagnosis	Co-morbidities	FFI	VAS	Follow up (months)	VAS	FFI
Female	64	Arthrosis TMT4/5	Degenerative flat foot	-	90	88	6	9
Female	50	Arthrosis TMT 4/5	Rheumatoid arthritis	60	80	23	3	17
Female	38	TMT 5 arthrodesis	Post traumatic	39	-	28	2	6
Female	67	Arthrosis TMT 4/5	Degenerative flat foot	65	95	102	13	34
Female	62	Arthrosis TMT 5	Degenerative flat foot	-	70	114	49	50
Female	62	Erosive arthritis TMT4/5	Rheumatoid arthritis	46	-	143	9	21
se Serie	es (n :	= 6; 50/50 ter	ndon)					Λ
4 pre/p - 个	ost so Funct	ored patients ion / ↓VAS-Pain				L		4
5/6 sat H A U S	isfied,	would repeat					/	



Hood et al (2017)



Lateral column of the foot arthoplasty with interpositional fascia lata graft: a new technique

Technique Description:

- Resection
 - 4/5MT-Cuboid base wedge resection, 0.5cm per side;
 - Preserve med, lat, plantar ligaments;
- Space Maintenance
 - Fascia lata graft (0.6–1.0-cm)
- Post-Op
 - 0-2-wks NWB BK Cast
 - 2-6 wks WBAT CAM
 - 6-wks+ \rightarrow Sneaker



Hood CR. TFAS, 2017.



Some General

Recommendations



- Be sure you need to fuse it
 - Correlating symptoms, imaging, accurate diagnostic block.
- Leave column alone with global TMT-AD
 - Can always go back later;
 - Arthroplasty quicker recovery (NWB: 2 vs 6-8 wks)
- Higher non-union rate
 - "Too stiff" a construct on mobile joint;
- If a LC-AD is performed, AVOID fusion of the lateral cuneiform-cuboid articulation:*
 - Motion exists at this joint –
 - Maintains some mobility between Me/MiC and LC
 - Decreases overall construct stiffness to \downarrow NonU rate



*Coetzee JC. Mann's 9th, 2014.

LC and Charcot



NEUHAUS FOOT & ANKLE Raikin SM. FAI, 2003. 12956562 Chang TM. McGlamry 4th, Ch 82. *Catanzariti AR. JFAS, 2000. 11055020



Recap



- Unfortunately, most of the published literature on this subject is not sufficient to make substantial conclusions.
- There *is* another option in considering LC treatment...
 - Is it a better option?
 - Than fusion?
 - "A valuable alternative to fusion" is excision arthroplasty (Coeztee JC)
 - Is there a better technique?
 - Isolated "anchovy";
 - Complete arthroplasty
 - Burns no/minimum bridges (Berlet et al)
 - Or should we stick with arthrodesis? Or nothing?
- Does this change the way you treat current injuries?

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 NEUHAUS









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Thank you

Question?

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