SOUTHWEST
Orthopedic Group, L.L.P.™

Lisfranc
To Fix or To Fuse?

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TEXAS ORTHOPEDIC ASSOCIATION
ANNUAL MEETING
4/22/2022

Disclosures

None

Objectives

- Anatomy
- Diagnosis
- Imaging

- **Open Reduction and Internal Fixation vs Primary Arthrodesis**

Spectrum

15 YEAR OLD MALE

39 YEAR OLD MALE

Spectrum

70 YEAR OLD FEMALE

Lisfranc Injury

- Tarsometatarsal fracture, dislocation

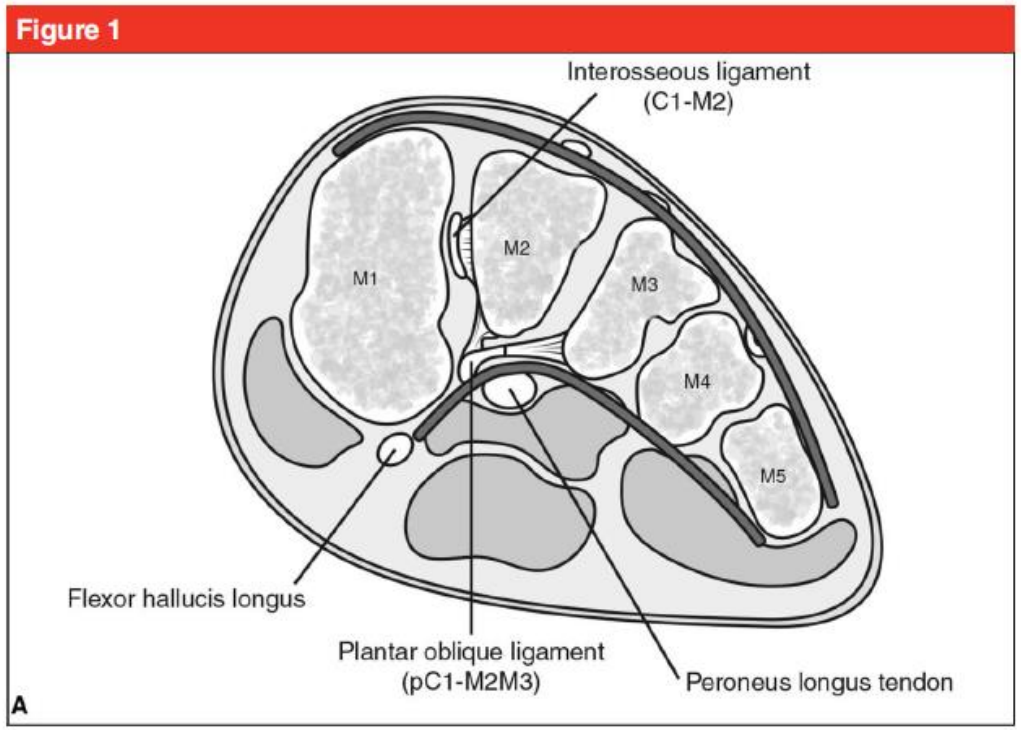
- Spectrum
  - Low energy stable sprain
  - High energy dislocations

- **20% of TMT injuries are missed**

Management of Tarsometatarsal Joint Injuries. *JAAOS.* July 2017, Vol 25, No 7: 469-479

Anatomy

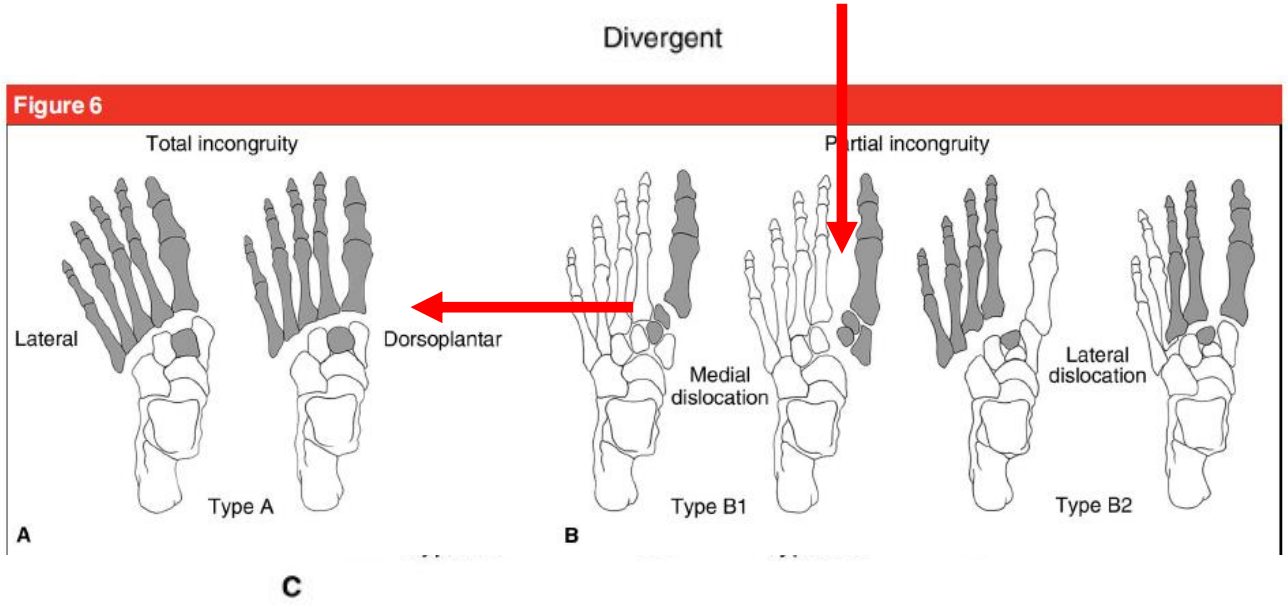
- Transverse intermetatarsal ligament
  - 2nd to 5th metatarsal provide stability
  - Absent first and second
- Lisfranc ligament complex
  - Dorsal (weakest)
  - Interosseous (strongest)
  - Plantar oblique
- Tendons
  - Tibialis anterior
  - Peroneus longus
- **ROM**
  - **2nd and 3rd TMT = 0.6 degrees**



Management of Tarsometatarsal Joint Injuries. *JAAOS.* July 2017, Vol 25, No 7: 469-479

Mechanism and Classification

- Crush
- Axial loading
  - Athlete with plantar flexed foot
- Rotational
  - Hindfoot fixed
  - Rotate through the midfoot



- Classifications provide descriptions
- Do not predicting treatment or outcomes

Management of Tarsometatarsal Joint Injuries. *JAAOS.* July 2017, Vol 25, No 7: 469-479

Diagnosis - Exam

- Plantar bruising
- Pain over TMT
  - Worse with abduction stress
- Piano key test

Management of Tarsometatarsal Joint Injuries. *JAAOS.* July 2017, Vol 25, No 7: 469-479

Diagnosis - Imaging

- Evaluation of the medial boarder 2nd metatarsal and the middle cuneiform
- Fleck sign
- **Contralateral images!**
- **Weightbearing!**
- Dorsal displacement

Management of Tarsometatarsal Joint Injuries. *JAAOS.* July 2017, Vol 25, No 7: 469-479

Diagnosis - Imaging

- Evaluation of the medial boarder 2nd metatarsal and the middle cuneiform
- Fleck sign
- Contralateral images!
- Weightbearing!
- Dorsal displacement
- **Stress Exam**
- CT helpful
- MRI for subtle injuries
  - Ligamentous

A B

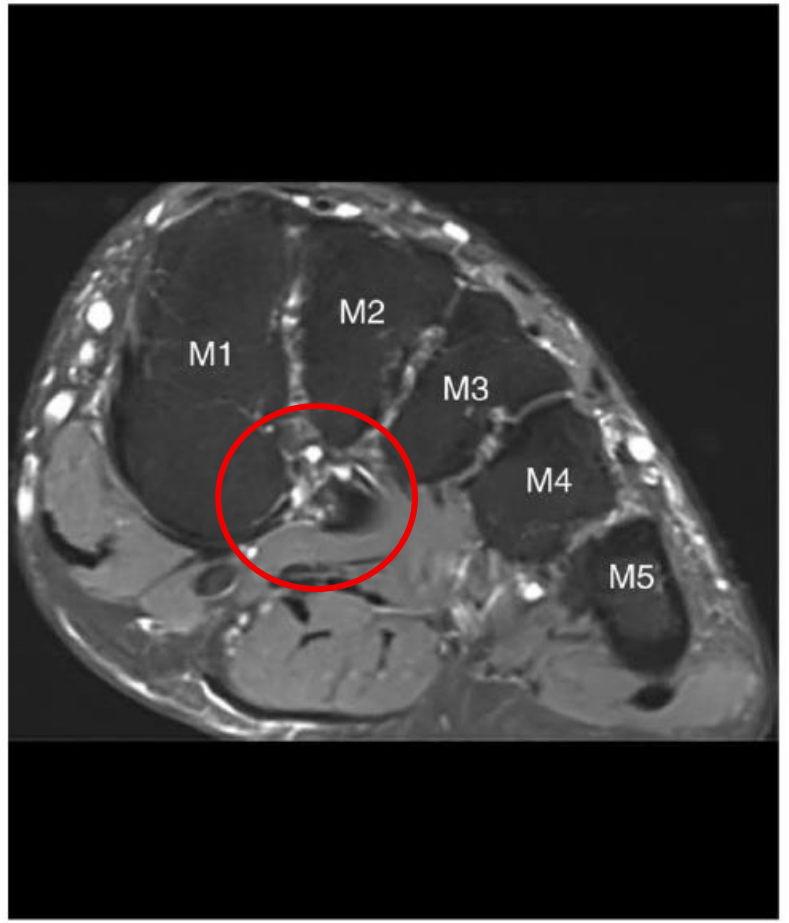
Management of Tarsometatarsal Joint Injuries. *JAAOS.* July 2017, Vol 25, No 7: 469-479

Prediction of midfoot instability in the subtle Lisfranc injury. Comparison of magnetic resonance imaging with intraoperative findings

Steven M Raikin [1], Ilan Elias, Sachin Dheer, Marcus P Besser, William B Morrison, Adam C Zoga

J Bone Joint Surg Am. 2009 Apr;91(4):892-9. doi: 10.2106/JBJS.H.01075.

- Patients with possible Lisfranc instability
- MRI to manual stress under anesthesia
- 21 patients
- **Results:**
- OR stress exam 17/21 with instability
- MRI 19/21 correctly identified
  - Plantar Lisfranc ligament
  - Rupture or grade 2+ sprain highly suggestive of instability



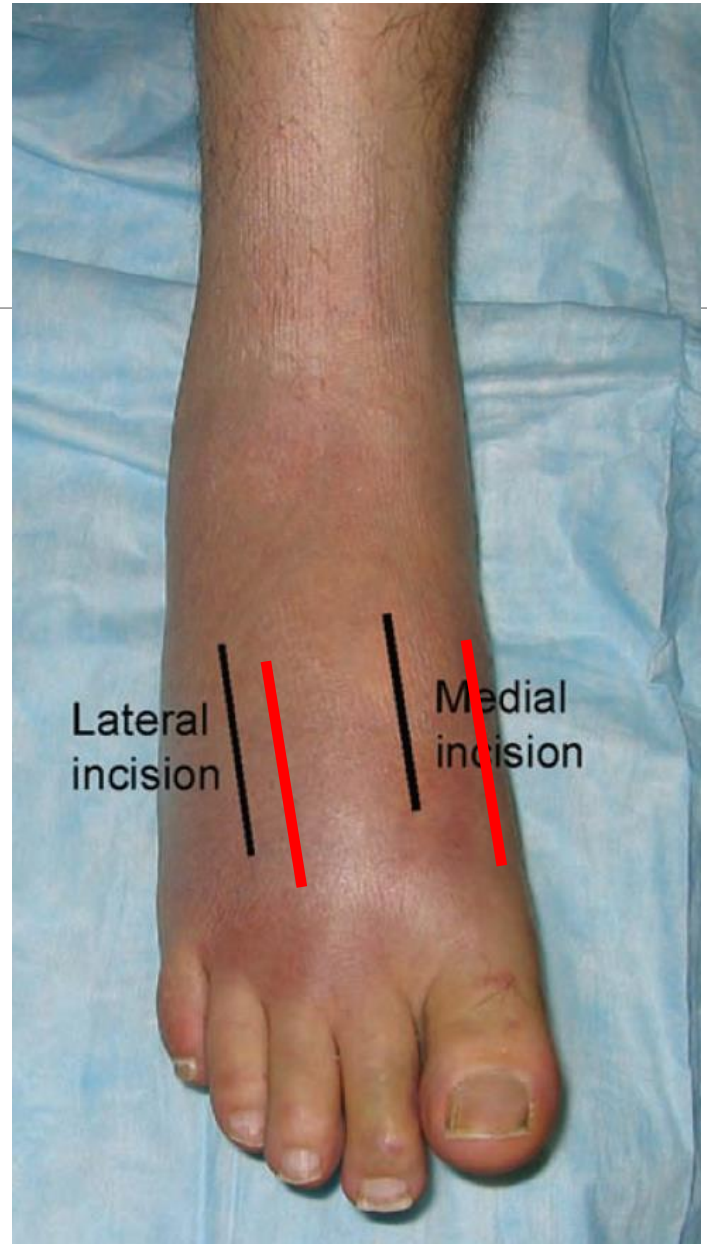
B

Treatment – Non-surgical

- Stable pattern
- **No change on serial exams and WB XRs**
- NWB in boot 4-6 weeks
- Progressive WB with arch supports

Treatment - Surgical

- Rigid medial and middle column
- Flexible lateral column
  - Never* fuse 4th and 5th TMT
- Equinus
  - TAL v Gastroc
- Inter-cuneiform instability
- Naviculocunieform instability
- Approach?
  - Single incision
  - **Double incision**
  - **NV Bundle**



*Never say never in orthopedics

Coetzee,C, Ly,T. Treatment of Primarily Ligamentous Lisfrance Joint Injuries: primary arthrodesis compared with open reduction and internal fixation. Surgical Technique. *JBJS.* March 2007; Vol 89-A, Supplement 2, Part 1.

To Fuse or Not to Fuse?

- ORIF
  - Crossing screws?
  - Dorsal plate with Lisfranc screw?
  - Suture button fixation?

- Arthrodesis

To Fuse or Not to Fuse?

- ORIF
  - Crossing screws?
  - Dorsal plate with Lisfranc screw?
  - Suture button fixation?
  - **When to remove hardware?**

- Arthrodesis

"Closet fuser"

To Fuse or Not to Fuse?

- ORIF
  - Crossing screws?
  - Dorsal plate with Lisfranc screw?
  - Suture button fixation?
  - When to remove hardware?
  - **Concern for Arthritis?**
- Arthrodesis
  - How many joints?
  - Bone graft?
  - **Concern for Nonunion?**

Outcomes following Midfoot Arthrodesis for Primary Arthritis

Scott A. Nemec, DO, Rohan A. Habbu, MS, John G. Anderson, MD, more...

First Published April 1, 2011 | Research Article | Find in PubMed | Check for updates

https://doi.org/10.3113/FAI.2011.0355

Post-Traumatic arthritis after ORIF

Range 27-94%

To Fuse or Not to Fuse?

- ORIF
  - Crossing screws?
  - Dorsal plate with Lisfranc screw?
  - Suture button fixation?
  - When to remove hardware?
  - **Concern for Arthritis?**
- Arthrodesis
  - How many joints?
  - Bone graft?
  - **Concern for Nonunion?**

Complications of Midfoot and Hindfoot Arthrodesis

Bibbo, Christopher DO[*,**]; Anderson, Robert B. MD[**]; Davis, W. Hodges MD[**]

Clinical Orthopaedics and Related Research: October 2001 - Volume 391 - Issue - p 45-58

Nonunion 3-8%

Trauma and healing

What does the literature say?

Outcome after open reduction and internal fixation of Lisfranc joint injuries

R S Kuo [1], N C Tejwani, C W Digiovanni, S K Holt, S K Benirschke, S T Hansen Jr, B J Sangeorzan

J Bone Joint Surg Am. 2000 Nov;82(11):1609-18. doi: 10.2106/00004623-200011000-00015.

Outcomes of ORIF?

Methods:

48 Lisfranc injuries

15 purely ligamentous

Results:

25% rate of arthritis

12.5% required arthrodesis

40% in purely ligamentous injuries

Conclusion:

Better reduction, less arthritis

Ligamentous may do better with fusion

Treatment of Primarily Ligamentous Lisfranc Joint Injuries: Primary Arthrodesis Compared with Open Reduction and Internal Fixation. A Prospective, Randomized Study

Thuan V. Ly and J. Chris Coetzee
J Bone Joint Surg Am. 2006;88:514-520. doi:10.2106/JBJS.E.00228

Methods:

41 patients randomized to ORIF v fusion

Results:

AOFAS Midfoot scores were higher in fusion group

5/20 ORIF were converted to fusion

One nonunion

Conclusion:

Primary arthrodesis shows better outcomes

Open reduction internal fixation versus primary arthrodesis for lisfranc injuries: a prospective randomized study

Jeffrey A Henning [1], Clifford B Jones, Debra L Sietsema, Donald R Bohay, John G Anderson

Foot Ankle Int. 2009 Oct;30(10):913-22.

Methods:

Compared fusion v ORIF

40 patients

Results:

Secondary surgeries:

- ORIF 79%
- Arthrodesis 17%

NO difference in function

Conclusion:

Less secondary procedures

No difference in outcomes scores

Fig. 3: Final Primary Arthrodesis Results–Oblique View.

Treatment of Lisfranc Fracture-Dislocations with Primary Partial Arthrodesis

Keith R. Reinhardt, MD; Luke S. Oh, MD; Patrick Schottel, MD; Matthew M. Roberts, MD; David Levine, MD

New York, NY

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DOI: 10.3113/FAI.2012.0050

Outcomes of PA?

Methods:

Ligamentous or osseous-ligamentous Lisfranc

25 patients underwent PA

Results:

21/25 Satisfied

2 Nonunions

No difference between Ligamentous and Osseous

Primary Arthrodesis versus Open Reduction and Internal Fixation for Low-Energy Lisfranc Injuries in a Young Athletic Population

Grant Cochran, MD[1], Christopher Renninger, MD[1], Trevor Tompane, MD[1], Joseph Bellamy, MD[2], and Kevin Kuhn, MD[1]

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- Low-energy Lisfranc – Military
  - PA v ORIF
- **Methods:**
  - 32 patients (28 YO)
  - FAAM
- **Results:**
  - Full duty:
    - PA 4.5 months
    - ORIF 6.7 months
  - PA Increased fitness score
  - FAAM no difference at 35 months
  - ROH 83% ORIF

	ORIF (n = 18)	PA (n = 14)	*P* Value
RTD Rate	89%	86%	1
Days to RTD	209	138	.0066
Days to first run test	369	320	.4
First run time minus preinjury average time	39 s slower/ mile	9 s slower/ mile	.032

Abbreviation: RTD, return to duty.

- **Conclusion:**
  - PA lower ROH
  - Earlier return to duty
  - Better fitness scores at one year

Temporary Bridge Plating vs Primary Arthrodesis of the First Tarsometatarsal Joint in Lisfranc Injuries: Randomized Controlled Trial

Are H. Stødle, MD[1,3], Kjetil H. Hvaal, MD, PhD[1], Helga M. Brøgger, MD[2], Jan Erik Madsen, MD, PhD[1,3], and Elisabeth Ellingsen Husebye, MD, PhD[1]

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- Purpose:
  - 1st TMT PA vs bridge plate
  - **2nd and 3rd TMT fusion**
  - 48 patients
- Results:
  - Functional scores the same at 2 years
  - ORIF had better 1st TMT alignment
  - **11/24 1st TMT DJD**
- Conclusion:
  - Both groups did well

A B C

Return to Sports and Physical Activities After Primary Partial Arthrodesis for Lisfranc Injuries in Young Patients

Aoife MacMahon, BA[1], Paul Kim, MD[1], David S. Levine, MD[1], Jayme Burket, PhD[2], Matthew M. Roberts, MD[1], Mark C. Drakos, MD[1], Jonathan T. Deland, MD[1], Andrew J. Elliott, MD[1], and Scott J. Ellis, MD[1]

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DOI: 10.1177/1071100715617743
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Methods:

- 38 patients at 5.5 years
- Age 32 years

Results:

- Difficulty (pre v postop):
  - 66% same
  - 34% increased
- Participation level
  - 75% improved or same
  - **25% decreased**
  - 97% satisfied with outcome

Conclusion:

- Overall, PA did well in return to sport

Sport	Preop. No. of Participants
Walking[b]	27
Bicycling[b]	23
Running[b]	17
Weightlifting[b]	17
Swimming[b]	9
Basketball[b]	7
Golf[b]	6
Dancing/aerobics[b]	5
Tennis[b]	5
Total body conditioning	4
Elliptical machine	3
Soccer[b]	5
Football[b]	3
Lacrosse[b]	2
Snowboarding	3
Spinning	1
Volleyball	4
Yoga	3
BMX biking	1
Circuit training	1
Hockey[b]	1
Mixed martial arts	1
Rock climbing	1
Rollerblading	1
Skateboarding	1
Squash[b]	1
Ultimate Frisbee	1
Hiking	1
Skiing	1
29	155

39 YO Male

CONSTRUCTION WORKER

FUSION

39 YO Male

CONSTRUCTION WORKER

FUSION

70 YEAR OLD FEMALE

MVC

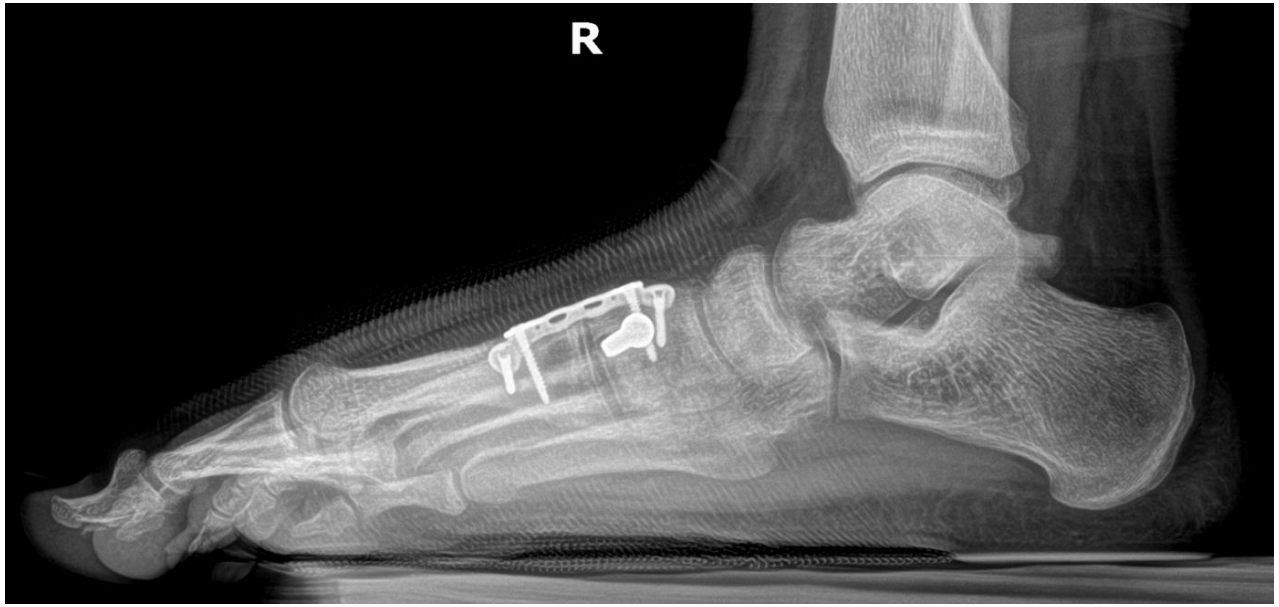
70 YEAR OLD FEMALE

15 YEAR OLD MALE

LOW ENERGY

15 Year old male

ORIF



Conclusion

- WB XRs (serial) vs Stress XR
- Two incisions

- ORIF
  - ROH vs Closet fuser
- Fusion
  - Less secondary surgeries
  - Better functional outcomes
  - Low nonunion rate

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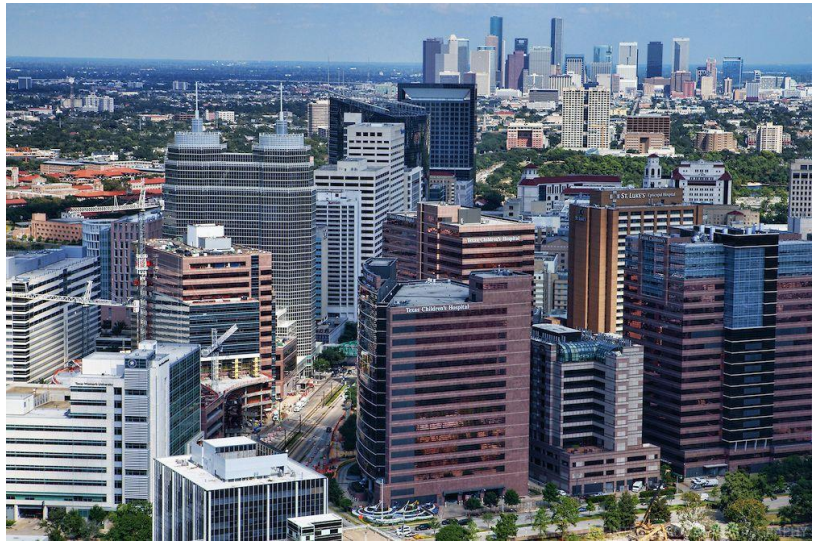
Thank You