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The risk of Adjustable Loop Suspensory Fixation Maldeployment in Surgically Managed Multiligament Knee Injuries: A retrospective cohort study

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Faculty Disclosure Information

- Personal disclosure:
 - Ryan Martin: Consultant for Smith and Nephew, CMO of Tactile Orthopedics
 - Prism Schneider: Consultant for Johnson & Johnson, Stryker

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Introduction and objectives

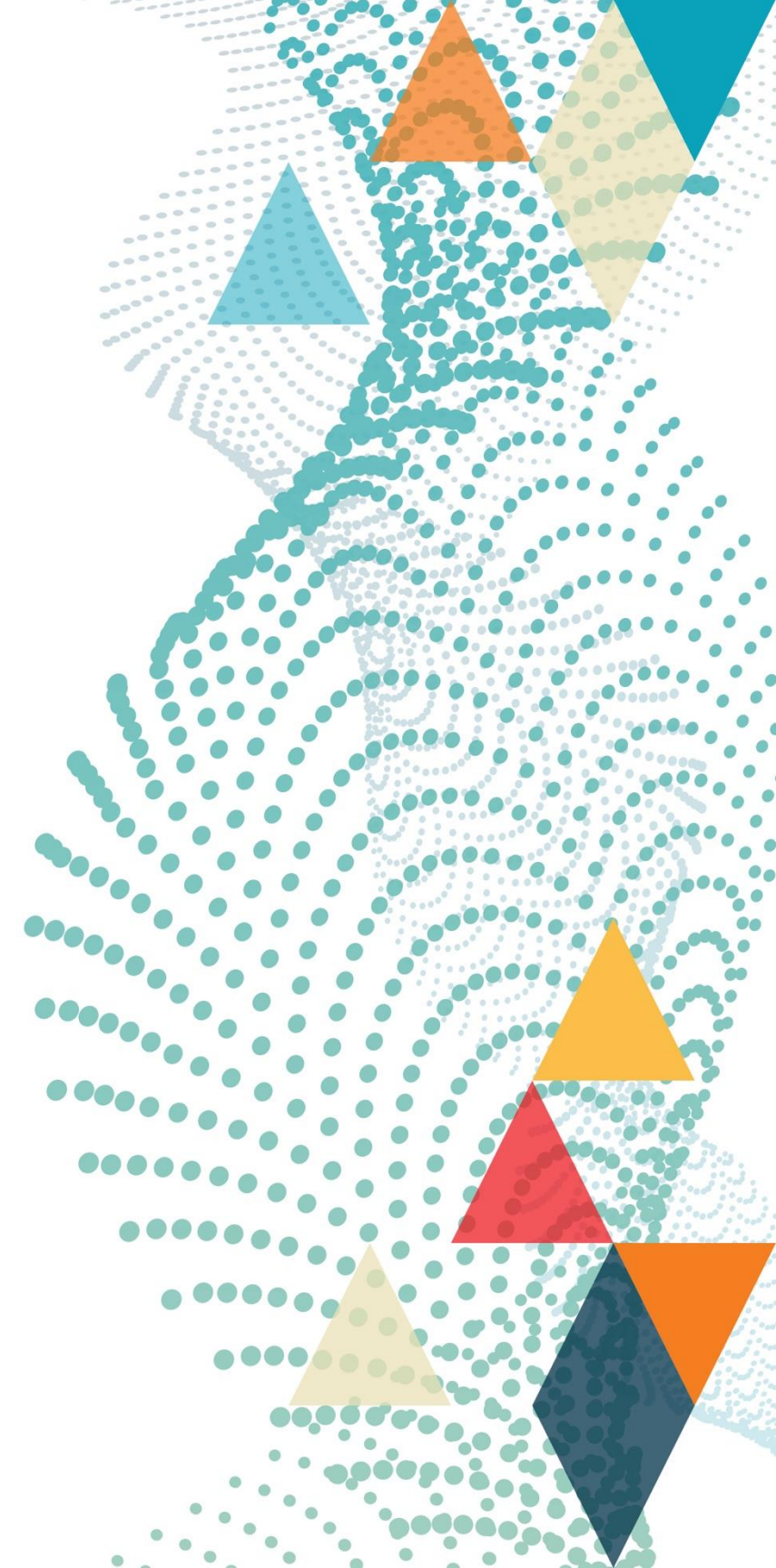
- Adjustable loop suspensory (ALS) fixation offers the ability to re-tension grafts in complex multiligament knee reconstruction
- A frequent reported complication of adjustable loop fixation is implant maldeployment
- Primary objective: to determine the risk implant maldeployment associated with ALS fixation in multiligament knee reconstruction
- Secondary objective: to determine the clinical impact of implant maldeployment



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Methods

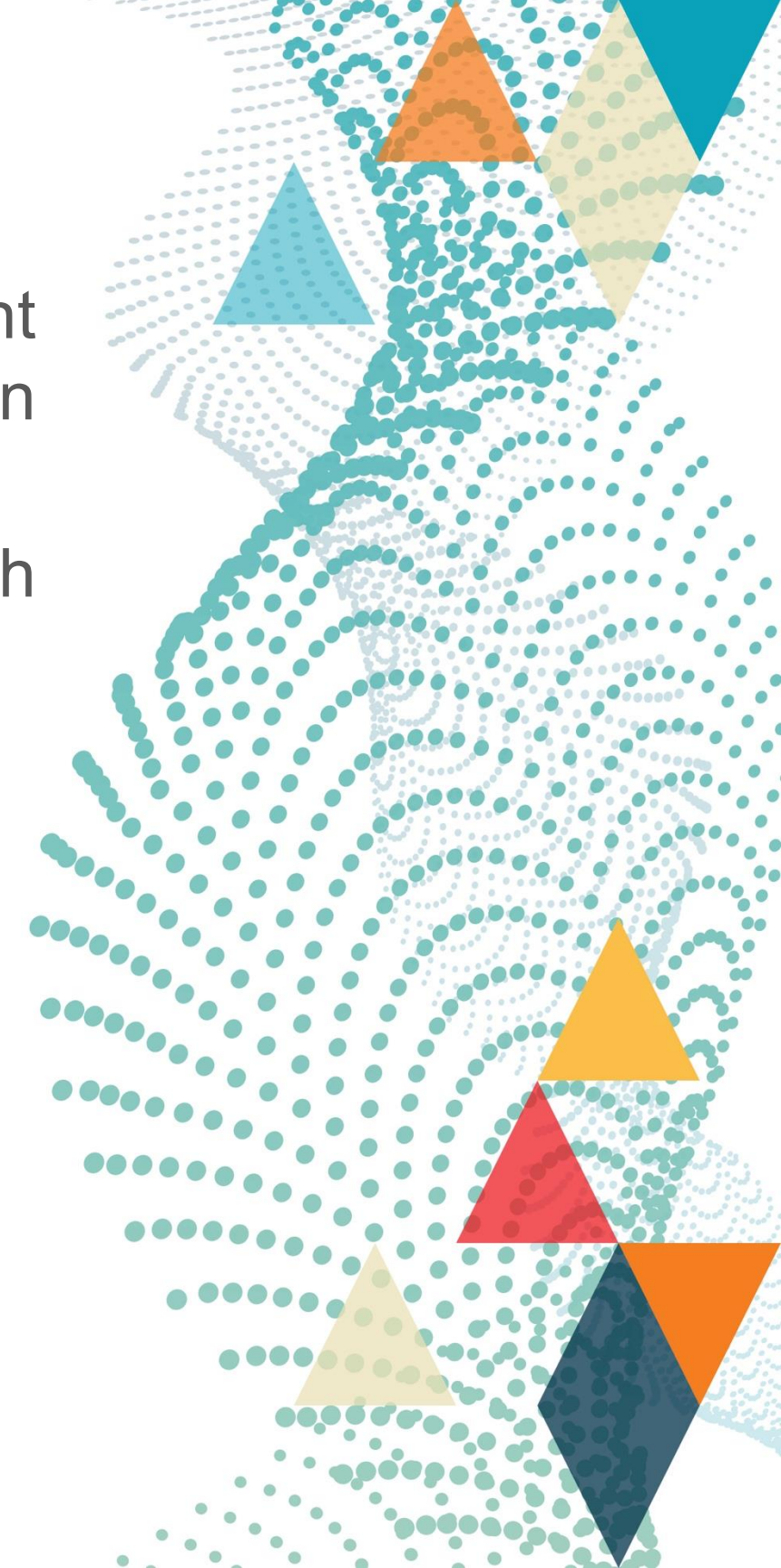
- Retrospective cohort study of adult patients that underwent multiligament knee reconstruction using ALS fixation, between January 1, 2018, and January 1, 2020
- Bivariate analyses were conducted comparing patients with and without maldeployment using:
 - samples t-test
 - Chi-Square test
 - Fischer exact test when appropriate
- $\alpha = 0.05$



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Outcomes measures

- Primary outcome:
 - Risk of implant maldeployment
 - as defined by radiologic soft-tissue interposition of >5mm or radiologic intraosseous button flip
- Secondary outcomes (according to implant maldeployment):
 - Postoperative Lysholm and Tegner scores
 - Postoperative knee range of motion
 - Risk of reoperation
 - Cohort stress radiographs side-to-side differences



Results – Cohort characteristics

Characteristics	All cohort (N=57)
Age – (mean ± SD, [range], years)	35 ± 10 [19-58]
Sex (% , male)	70% (N=40)
BMI	28 ± 6 [21-48]
Mechanism of Injury	
Sports	47%
Fall from Height	19%
Moto vehicle	10%
Pedestrian struck	5%
Other	19%
Acute reconstruction (< 6 weeks) – (%)	42% (N=24)
Schenk Classification (% , N)	
KD2	47% (27)
KD3	40% (23)
KD4	9% (5)
KD5	4% (2)
Meniscal Repair (% , N)	81% (45)
Maldeployment (% , N of patients)*	19% (11)
Soft-tissue interposition	14% (8)
Intra-osseous	5% (3)
Reoperation*	19% (11)
Revision	2% (1)
Implant Removal	5% (3)
Arthrolysis	14% (8)
Follow-up – (mean ± SD, years)	1.07 ± 0.74

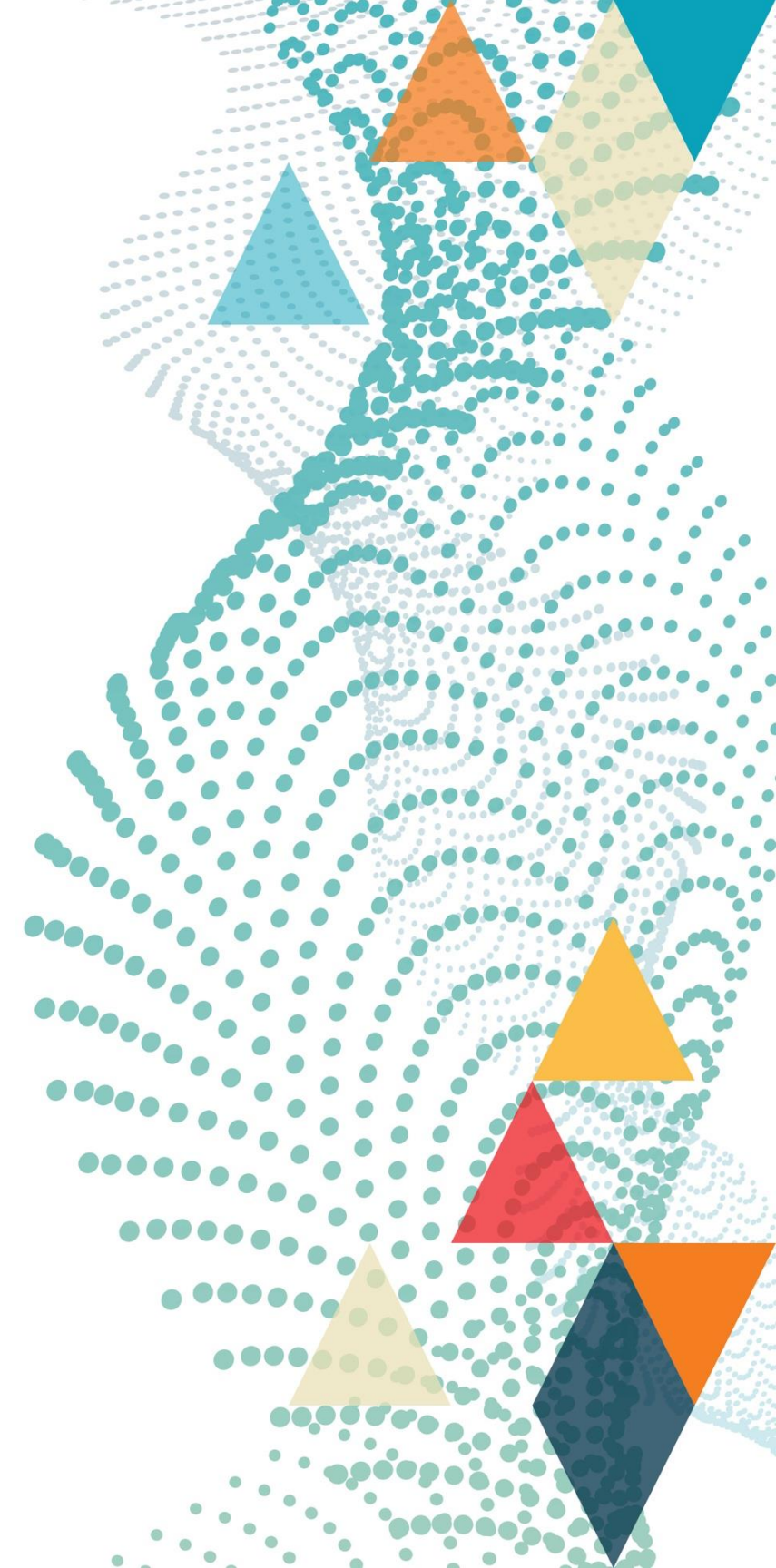
*All maldeployed implants involved the MCL and PCL PM femoral bundle fixation



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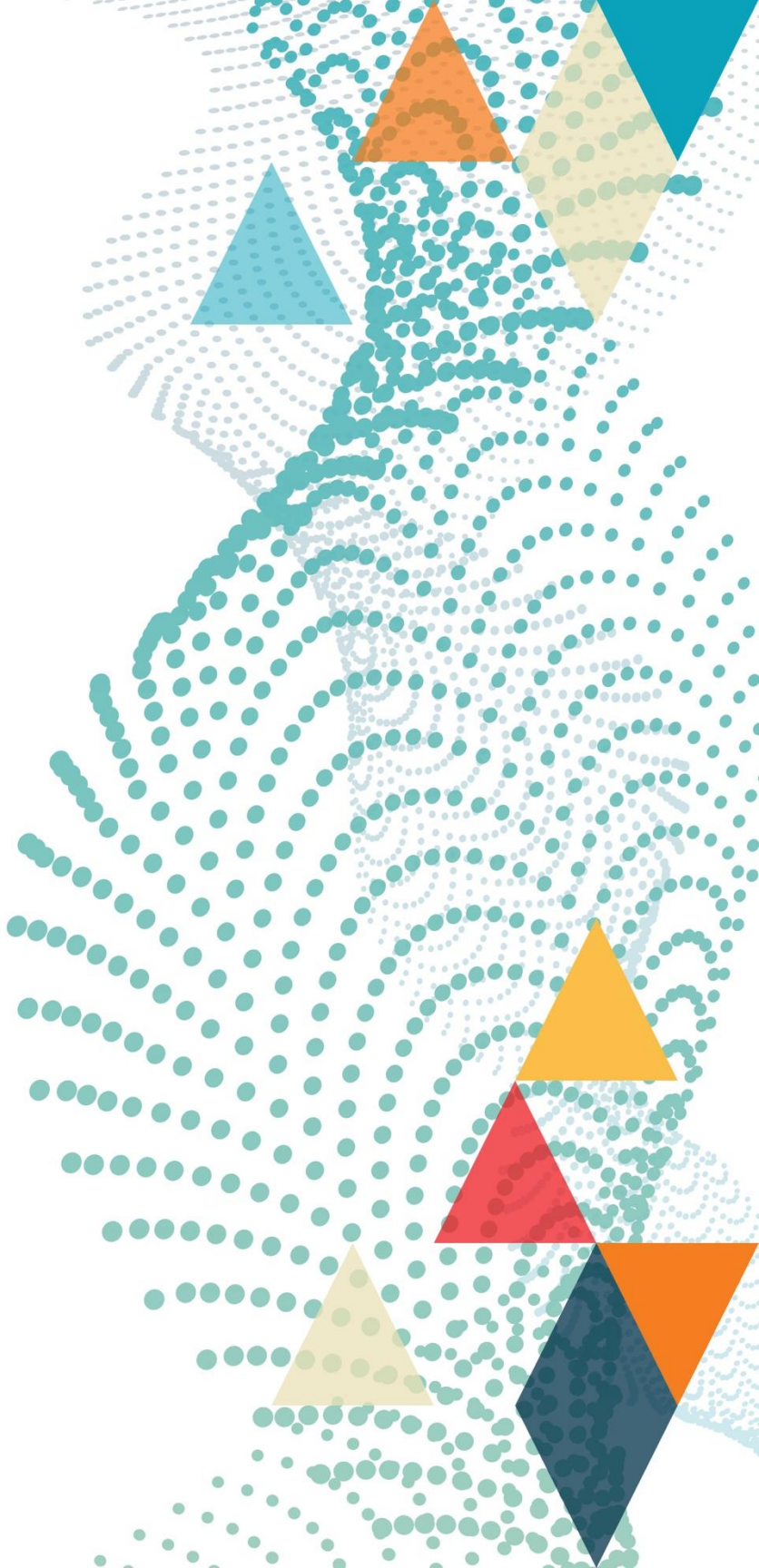
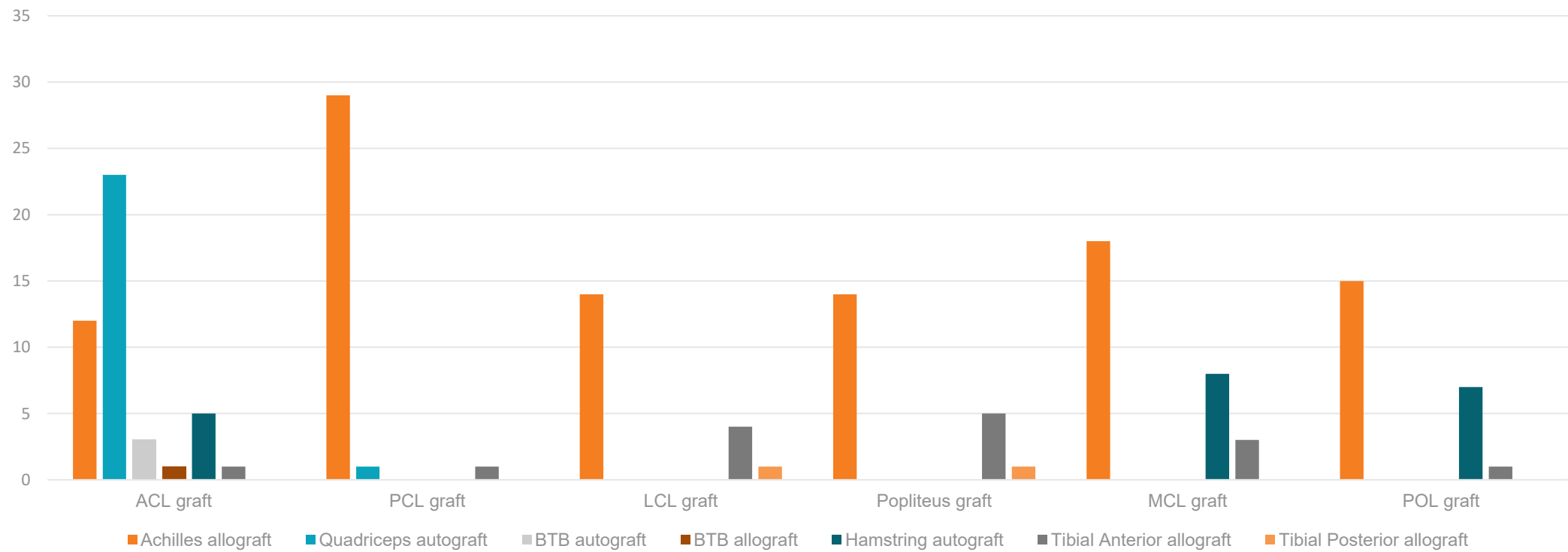


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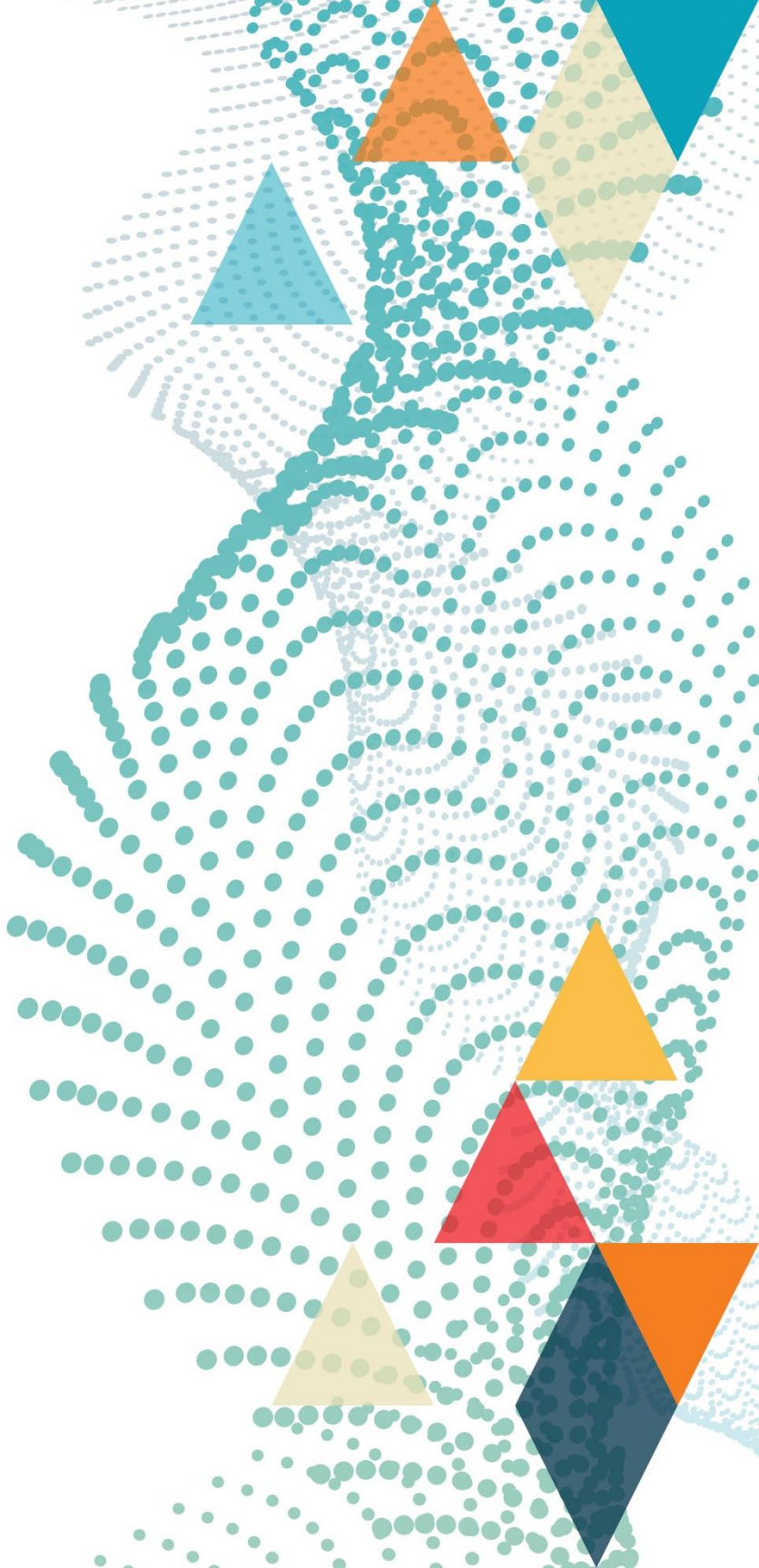
Results

Graft used according to ligament reconstructed



Results – Clinical outcomes according to maldeployment status

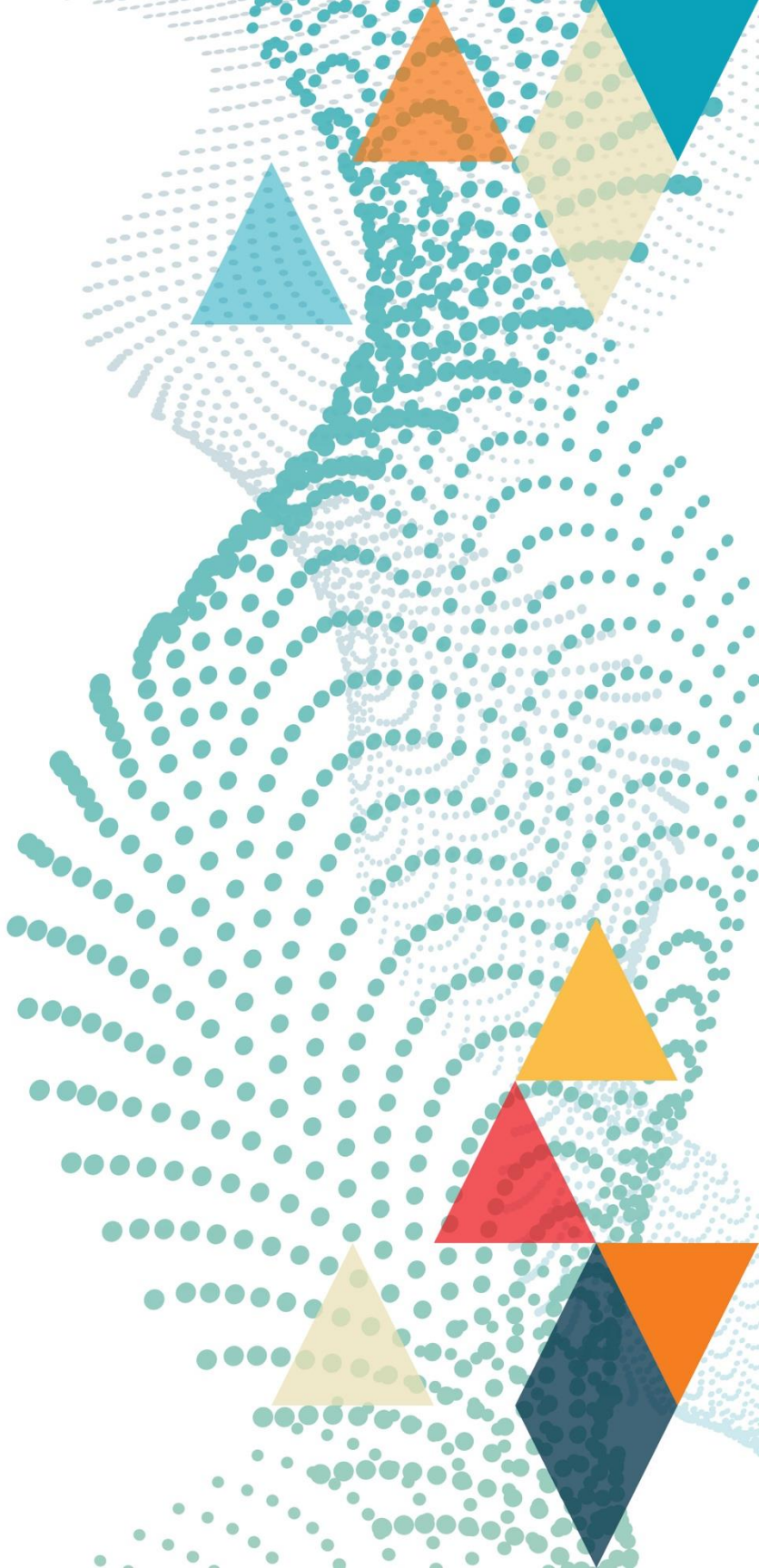
Characteristics	All cohort (N=57)	Well deployed (N=46)	Maldeployed (N=11)	p-value
Tegner score	5 ± 2	5 ± 2	5 ± 2	0.8117
Lysholm score	85 ± 12	85 ± 11	81 ± 14	0.4013
Final extension (degrees)	0.5 ± 2.8	0.2 ± 1.0	1.8 ± 6.0	0.4035
Final flexion (degrees)	134 ± 11	135 ± 9	128 ± 15	0.1426
Reoperation (% , N)				
Revision	2% (1)	0% (0)	9% (1)	0.1930
Hardware removal	5% (3)	7% (3)	0% (0)	0.5188
Arthrolysis	14% (8)	9% (4)	36% (4)	0.0371



Results - Postoperative stress radiographs side to side differences

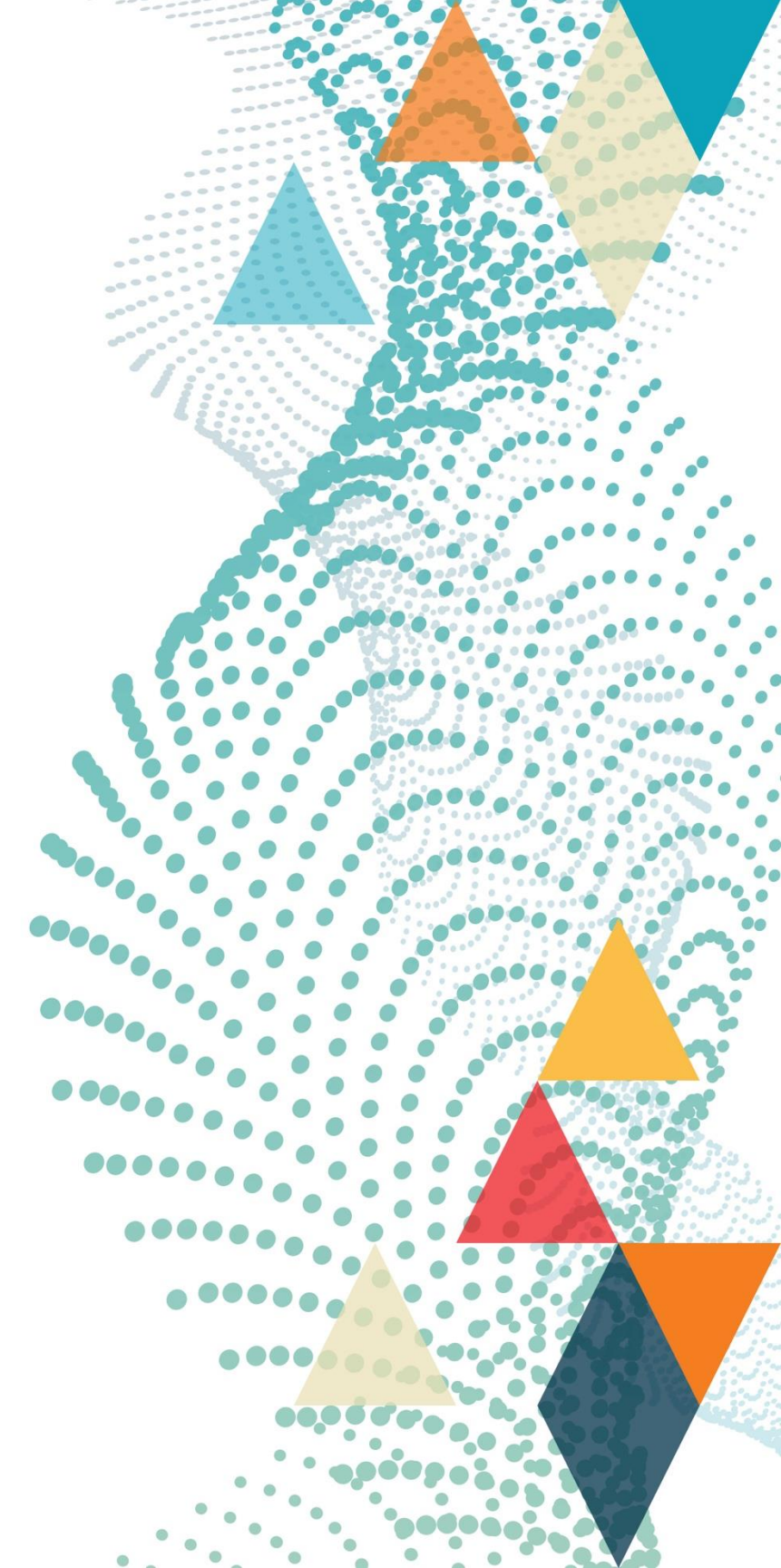
Characteristics	All cohort
PCL side to side difference (median, mm)*	1.4 ± 4.9
PCL laxity*	23% (5)
MCL side to side difference (mean, mm)**	0.6 ± 1.8
MCL laxity**	6% (1)
LCL side to side difference (mean, mm)***	-0.3 ± 1.4
LCL laxity***	6% (1)

*Missing 18/36, **Missing 7/24, ***Missing 12/30

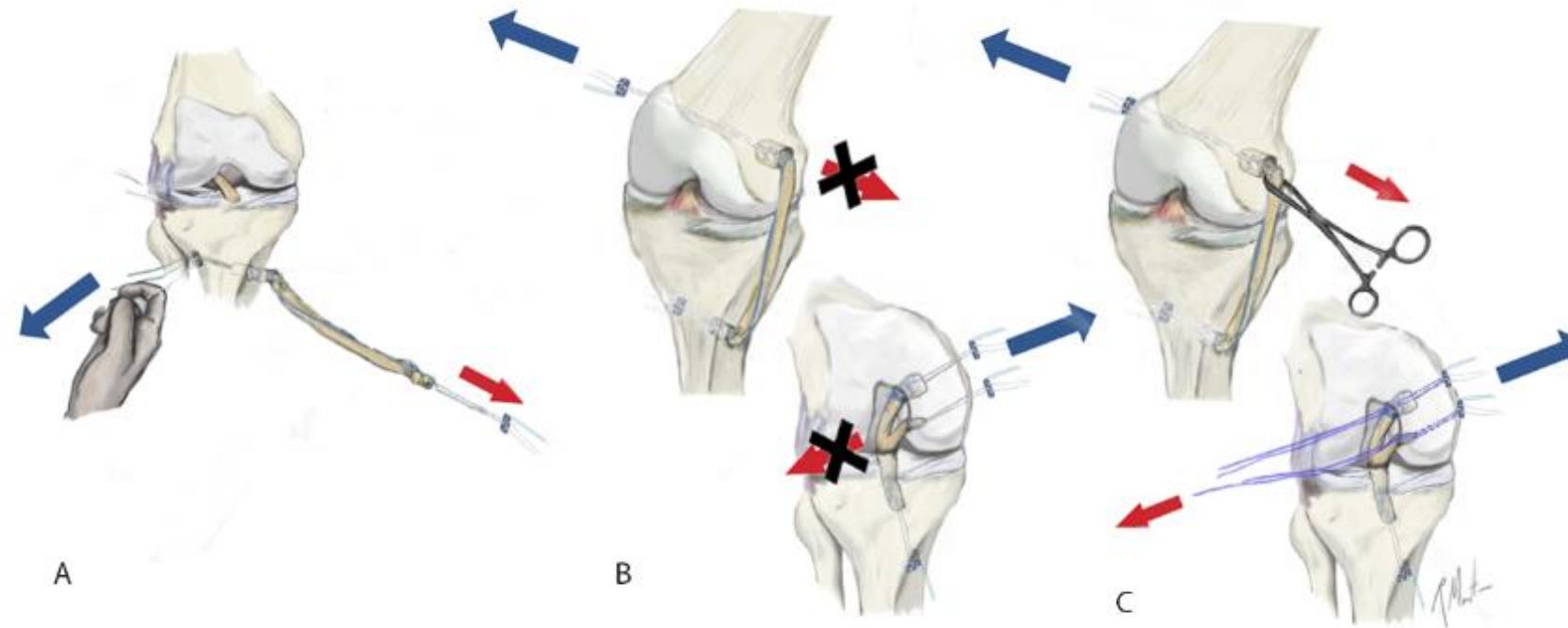


Conclusion

- This cohort of multiligament knee injuries demonstrates a moderate risk of implant maldeployment when using ALS fixation
- Even when maldeployment occurs, ALS fixation demonstrates similar favorable clinical outcomes except for reoperation for arthrolysis
- Surgeons should be cautious with their surgical technique when using ALS for MCL fixation and PCL PM bundle fixation
- Employing a technique to provide counterforce may help reduce the occurrence of maldeployment



Illustrated surgical technique to minimize the risk of button maldeployment and soft tissue interposition



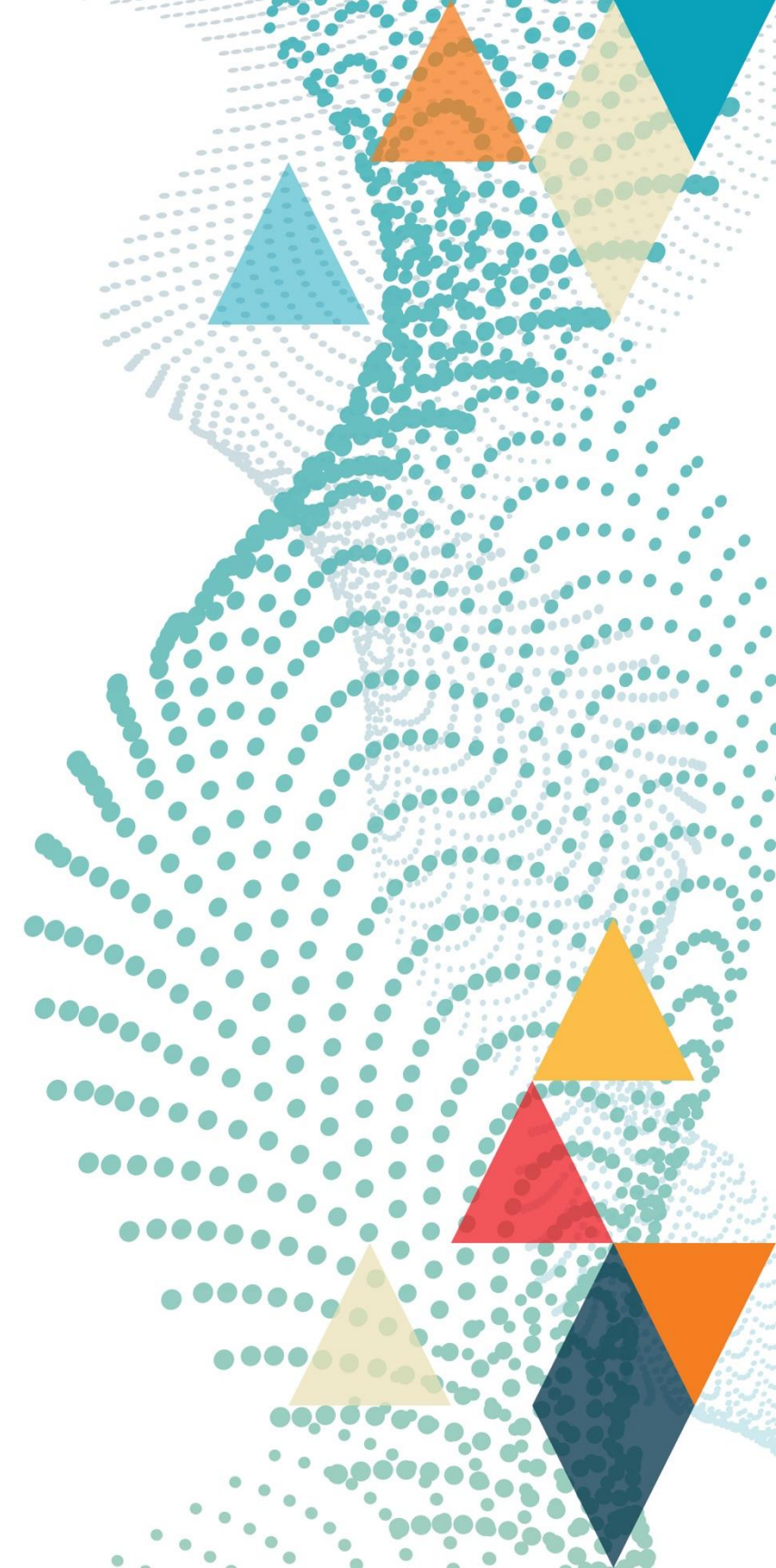
- A. During tensioning of the first end of a double suspensory graft, you can provide a counter pulling force which keeps the button flush on bone
- B. During tensioning of the second end of a double suspensory graft you no longer have the ability to provide a force to counter the tensioning force which can pull the button off bone. Upper image demonstrates MCL reconstruction. Lower image demonstrates double bundle PCL reconstruction
- C. Clamping the graft or inserting a looped suture through the button allows you to pull and apply a counter tension force keeping the button flush on bone and eliminating soft tissue incarceration. Blue arrow demonstrates direction of tensioning. Red arrow demonstrates counter pull.



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