



Effectiveness of Microfragmented Adipose Tissue Injection in the Treatment of Rotator Cuff Tendinopathy: 01-Year Follow-Up

### Authors:

Ronald Bispo Barreto, MD, PhD Ricardo Euzebio Ribeiro Silva Junior, MD Juliana Maria Lira, MD João Marcos Santos, MD Bernard Barbosa, MD





# Disclosures:

We declare that in this presentation we have no financial, personal or professional conflicts of interest that could affect the results or conclusions of the presented study.



# INTRODUCTION

- Rotator Cuff Tendinopathy (RCT) is an inflammatory and multifactorial degenerative disease.
- Its manifestation reduces the quality of life of patients.
- Treatment begins clinically aiming for symptom relief. However, the literature shows that up to 67% of cases remain unsuccessful and may evolve with the need for surgical intervention.
- In this scenario, the injection of Microfragmented Adipose Tissue is considered an emerging regenerative treatment option.







To analyze the efficacy of autologous microfragmented adipose tissue injection in pain and functional performance in patients with rotator cuff tendinopathy.





#### Samples

- patients with rotator cuff tendinopathy treated at the orthopedic outpatient clinic of the University Hospital
- aged between 40 and 75 years, with confirmed rotator cuff tendinopathy, partial rupture and/or transfixing injury
- Obtaining mesenchymal stem cells
  - Abdominal lipoaspirate under local anesthesia
  - Decantation and pre-emulsification fat collect
  - Fat micro-emulsification process until 394 micrometers filtration





#### Ultrasound-guided procedures

- Injection were performed thru antero-lateral access
- All guided by ultrasound with a linear transducer
- Local anesthetic blockade with 2 ml of 2% lidocaine
- Injection targets: subacromial subdeltoid bursa space and intra tendinous





#### Clinical evaluation

- UCLA Functional Assessment Scale
- SPADI (Shoulder Pain and Disability Index) questionnaire
- CSS (Constant Shoulder Score)
- Strength Assessment
  - a digital manual dynamometer (Lafayette Manual Muscle Test System) was used
- Patients were evaluated before the procedure, after 7 days, after 01, 03, 06 and 12 months after injection



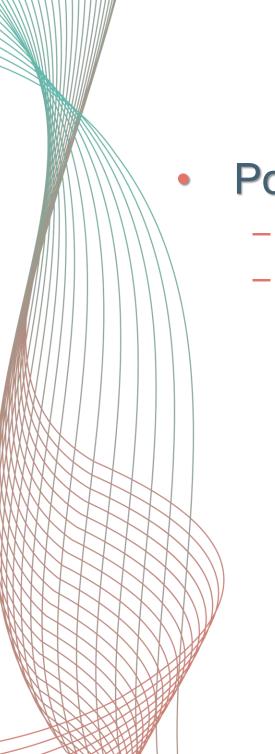


#### Data analysis

- Categorical variables were described using absolute and relative percentage frequencies.
- Continuous variables were described as mean, standard deviation, median and interquartile range.
- The hypothesis of independence between categorical variables was tested using the Chi-Square test.
- The hypothesis of equality of means was tested by means of ANOVA.
- Multiple comparisons were tested using the Tukey test.
- The significance level adopted was 5%
- Software used was the R Core Team 2021.







### RESULTS

#### Population characteristics

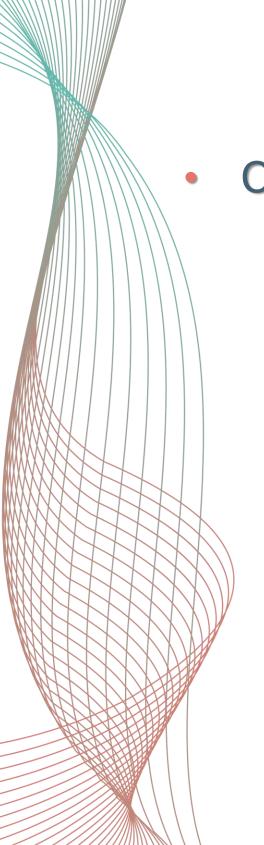
- 12 different patients were included
- 14 shoulders affected (7 shoulders from each side)

	N (%)	Mean (SD)	Median (IQR)
Sex			
Female	7 (58.3)		
Male	5 (41.7)		
Age		50 (8.8)	47 (45-53)
Weight		75.1 (16.3)	69 (65.4-90.8)
Height		163.2 (10.2)	160.5 (157.5-167.8)
BMI		28.1 (5.2)	27.5 (24.6-31.4)

Legends: N – sample size; % – relative frequency distribution; SD – Standard deviation; IQR – Interquartile range.



9



### RESULTS

#### Clinical evaluation at one-year follow-up

	UCLA	SPADI	CSS
	Mean (SD)	Mean (SD)	Mean (SD)
Follow-up appointment			
Pre-Operative	16.9 (5.6)	58.0 (26.7)	60.1 (19.4)
7 days	22.0 (7.4)	56.2 (24.8)	57.0 (14.8)
1 month	28.1 (4.8)	31.5 (23.5)	72.1 (7.4)
3 months	27.5 (7.1)	22.4 (21.6)	67.6 (13.7)
6 months	28.8 (6.4)	28.7 (28.0)	70.9 (12.6)
1 year	30.4 (5.4)	13.9 (17.1)	71.8 (9.7)
p-value	< 0.001	<0.001	0.023

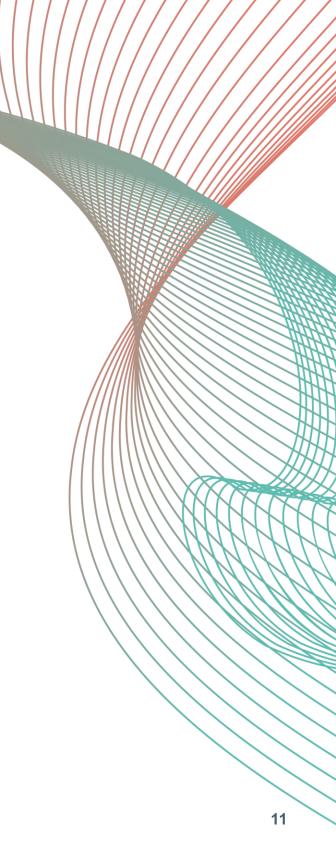
Legends: SD – Standard deviation; IQR - Interquartile range; ANOVA – Analysis of Variance.



### CONCLUSIONS

- Microfragmented Adipose Tissue Injections (MATI) improve functional outcome and pain in patients with rotator cuff tendinopathy.
- MATI was effective in the long-term rotator cuff tendinopathy treatment.
- These findings indicate therapeutic efficacy and create new possibilities for the approach of degenerative osteotendinous pathologies, restoring function and reducing morbidity, allowing these patients to return to socioeconomic activities.





### REFERENCES

- 1. Carvalho, M.A.P.; Moreira, C. Noções Práticas de Reumatologia. *Belo Horizonte: Health* **1996**.
- Macêdo, P.R.S.; Costa, R.C.S.; Souza, C.G.; Leite, E.C.F. Intervenções Fisioterapêuticas Na Tendinopatia Do Ombro: Uma Revisão de 2. literatura. Anais do Cingresso Internacional de Envelhecimento Humano 2015, 2.

- Weintein, S.L.; Buckwalter, S.L. Ortopedia de Turek: Princípios e Aplicação 2000. 3.
- de Souza Lima, G.C.; Barboza, E.M.; Alfieri, F.M. Análise Da Funcionalidade e Da Dor de Indivíduos Portadores de Síndrome Do Impacto, 4. Submetidos à Intervenção Fisioterapêutica. Fisioterapia em Movimento (Physical Therapy in Movement) 2007, 20.
- Jobe, C.M.; Coen, M.J.; Screnar, P. Evaluation of Impingement Syndromes in the Overhead-Throwing Athlete. J Athl Train 2000, 35, 293–299. 5.
- Mehta, S.; Gimbel, J.A.; Soslowsky, L.J. Etiologic and Pathogenetic Factors for Rotator Cuff Tendinopathy. Clin Sports Med 2003, 22, 791-6. 812, doi:10.1016/s0278-5919(03)00012-7.
- 7. Metzker, C.A.B. Tratamento Conservador Na Síndrome Do Impacto No Ombro. *Fisioterapia em movimento* **2010**, 23, 141–151.
- 8. Hu, L.; Wang, J.; Zhou, X.; Xiong, Z.; Zhao, J.; Yu, R.; Huang, F.; Zhang, H.; Chen, L. Exosomes Derived from Human Adipose Mensenchymal Stem Cells Accelerates Cutaneous Wound Healing via Optimizing the Characteristics of Fibroblasts. Sci Rep 2016, 6, 32993, doi:10.1038/srep32993.
- Lee, S.Y.; Kwon, B.; Lee, K.; Son, Y.H.; Chung, S.G. Therapeutic Mechanisms of Human Adipose-Derived Mesenchymal Stem Cells in a Rat 9. Tendon Injury Model. Am J Sports Med 2017, 45, 1429–1439, doi:10.1177/0363546517689874.
- 10. Caplan, A.I. Mesenchymal Stem Cells: Time to Change the Name! Stem Cells Transl Med 2017, 6, 1445–1451, doi:10.1002/sctm.17-0051
- 11. Rothrauff, B.B.; Smith, C.A.; Ferrer, G.A.; Novaretti, J.V.; Pauyo, T.; Chao, T.; Hirsch, D.; Beaudry, M.F.; Herbst, E.; Tuan, R.S.; et al. The Effect of Adipose-Derived Stem Cells on Enthesis Healing after Repair of Acute and Chronic Massive Rotator Cuff Tears in Rats. J Shoulder Elbow Surg 2019, 28, 654–664, doi:10.1016/j.jse.2018.08.044.
- 12. Roy, J.-S.; Braën, C.; Leblond, J.; Desmeules, F.; Dionne, C.E.; MacDermid, J.C.; Bureau, N.J.; Frémont, P. Diagnostic Accuracy of Ultrasonography, MRI and MR Arthrography in the Characterisation of Rotator Cuff Disorders: A Systematic Review and Meta-Analysis. Br J Sports Med 2015, 49, 1316-1328, doi:10.1136/bjsports-2014-094148.



### REFERENCES

- 13. Teunis, T.; Lubberts, B.; Reilly, B.T.; Ring, D. A Systematic Review and Pooled Analysis of the Prevalence of Rotator Cuff Disease with Increasing Age. J Shoulder Elbow Surg 2014, 23, 1913–1921, doi:10.1016/j.jse.2014.08.001.
- 14. Lin, T.T.-L.; Lin, C.-H.; Chang, C.-L.; Chi, C.-H.; Chang, S.-T.; Sheu, W.H.-H. The Effect of Diabetes, Hyperlipidemia, and Statins on the Development of Rotator Cuff Disease: A Nationwide, 11-Year, Longitudinal, Population-Based Follow-up Study. Am J Sports Med 2015, 43, 2126-2132, doi:10.1177/0363546515588173.
- 15. Behfar, M.; Sarrafzadeh-Rezaei, F.; Hobbenaghi, R.; Delirezh, N.; Dalir-Naghadeh, B. Enhanced Mechanical Properties of Rabbit Flexor Tendons in Response to Intratendinous Injection of Adipose Derived Stromal Vascular Fraction. Curr Stem Cell Res Ther 2012, 7, 173–178, doi:10.2174/157488812799859874.
- 16. Jo, C.H.; Chai, J.W.; Jeong, E.C.; Oh, S.; Kim, P.S.; Yoon, J.Y.; Yoon, K.S. Intratendinous Injection of Autologous Adipose Tissue-Derived Mesenchymal Stem Cells for the Treatment of Rotator Cuff Disease: A First-In-Human Trial. Stem Cells 2018, 36, 1441–1450, doi:10.1002/stem.2855.
- 17. Kim, Y.S.; Sung, C.H.; Chung, S.H.; Kwak, S.J.; Koh, Y.G. Does an Injection of Adipose-Derived Mesenchymal Stem Cells Loaded in Fibrin, Glue Influence Rotator Cuff Repair Outcomes? A Clinical and Magnetic Resonance Imaging Study. Am J Sports Med 2017, 45, 2010–2018 doi:10.1177/0363546517702863

