No exacerbation of knee joint pain and effusion following preoperative progressive resistance training in patients scheduled for total knee arthroplasty

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Disclosures

- Related to present study:
  - Aarhus University, Denmark; Department of Physiotherapy and Occupational Therapy, Aarhus University Hospital; Bevica Foundation; Danish Rheumatism Association; Danish Physiotherapy Research Foundation; Orthopedic Surgery Research Foundation; Aase and Ejnar Danielsen Foundation; The Research Foundation of the Central Region Denmark

- Outside present study: None

Background

- High-intensity exercise programs have been avoided in end-stage knee osteoarthritis due to fear of exacerbation of knee joint pain and effusion

- Clinicians are commonly reluctant to apply high-intensity exercises in patients with painful and swollen knee

Purpose

To examine if progressive resistance training prior to total knee arthroplasty

- would exacerbate pain and knee effusion and

- would allow an increase of the training load throughout the training period and subsequently increase muscle strength

Study design and patients

- Secondary analyses from a recent randomised trial

- Patients were included from Aarhus University Hospital and Silkeborg Regional Hospital

- Patients were randomly assigned to preoperative progressive resistance training or were instructed to "live as usual" in 4 weeks before surgery

- 30 patients were assigned to the intervention group

Criteria

Including criteria

- Scheduled for primary unilateral TKA
- Diagnosed with OA
- Resident in the Aarhus municipality
- Able to transport them-selves to training

Excluding criteria

- Age <18 years
- Suffering from heart disease or uncontrolled hypertension
- Suffering from neuromuscular or neurodegenerative conditions
- Unable to comprehend the protocol instructions

Patients

Sex (female/male) (n)   19/11
Age (years)   70.7 (7.3)
Height (m)*   1.67 [1.45-1.84]
Weight (kg)*   83.6 [56.8-117.2]
Body mass index (kg/m^2)*   30.0 [22.6-42.5]

Values are means (standard deviation) or * median [range].

Six exercises comprising the PRT program

60 minutes per session – 3 sessions/week in groups

Leg press

Knee flexion

Knee extension

Hip abduction

Hip adduction

Hip extension

Training progression

Week	Sets	Repetitions	Load	Rest between sets and exercises
1	3	12	12 RM	2 min.
2	3	10	10 RM	2 min.
3	3	8	8 RM	2 min.
4	3	8	8 RM	2 min.

Outcome measures

- Pain at rest (numerical rating scale 0-10)

- Knee circumference (1 cm above patella)

- 1 repetition maximum

Pain at rest before and after each training session

Session	Before training		After training	
	Median	**IQR#**	**Median**	**IQR#**
1	0.5	0-2	0	0-2
2	1	0-2	0	0-2
3	0	0-2	0	0-1
4	0	0-1	0	0-1
5	0	0-1	0	0-1
6	0	0-2	0	0-2
7	0	0-1	0	0-2
8	0	0-1	0	0-2
9	0	0-1.5	0.5	0-2
10	1	0-2	0	0-2
11	0	0-1	0	0-1
12	0	0-1	0	0-1

IQR, interquartile range
Pain after training was unchanged over time *(p = 0.99)* (Kruskal-Wallis)

Knee circumference before and after each training sessions
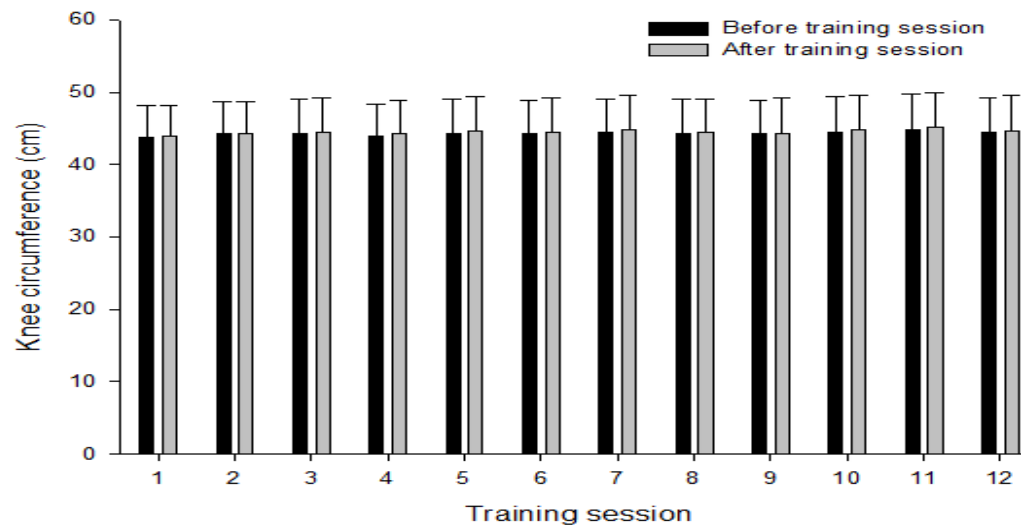
Bars indicate means and whiskers standard deviation

1RM (kg) before the first and last training session and training load (kg) during each training session

Training session	RM	Leg press Load Mean	SD	Knee extension Load Mean	SD	Knee flexion Load Mean	SD	Hip extension Load Mean	SD	Hip abduction Load Mean	SD	Hip adduction Load Mean	SD
1	1RM	54.3	25.4	22.2	14.0	16.9	7.9	---	---	---	---	---	---
1	12	31.4	13.7	13.0	9.1	8.9	4.6	7.2	2.8	4.8	2.9	6.6	2.1
2	12	34.5	13.9	12.5	8.6	10.2	3.8	7.9	3.6	5.8	2.9	7.0	2.7
3	12	36.4	13.7	14.8	8.6	11.2	4.1	9.3	3.2	6.4	2.9	7.9	2.6
4	10	37.4	13.4	15.3	9.6	12.2	4.4	10.0	3.3	6.8	2.7	8.9	2.8
5	10	39.3	13.5	16.5	10.2	13.5	4.3	11.1	3.7	7.9	2.7	9.7	3.2
6	10	40.6	13.6	17.7	10.4	14.4	4.7	11.8	3.8	8.0	2.9	10.1	3.3
7	8	44.4	14.7	18.5	11.0	15.4	4.9	12.9	3.9	8.9	2.9	11.7	3.7
8	8	45.4	14.4	19.9	11.1	15.9	5.1	13.4	4.1	9.3	3.0	11.8	4.5
9	8	46.4	15.0	21.2	10.7	16.6	5.6	14.0	4.1	9.5	3.2	12.3	4.7
10	8	49.1	14.7	22.2	11.2	16.9	5.4	14.9	4.6	10.1	3.5	13.5	5.0
11	8	51.8	15.5	23.0	11.8	17.8	5.0	15.5	4.8	10.5	3.8	13.9	5.4
12	8	50.6	18.4	23.3	9.6	18.8	6.4	16.5	5.5	11.8	4.1	14.8	6.5
12	1RM	59.7	23.2	27.7	12.9	23.9	8.4	---	---	---	---	---	---

Leg press: 18% ↑   Knee extension: 81% ↑   Knee flexion: 53% ↑

Conclusion

Progressive resistance training of the affected leg initiated shortly before total knee arthroplasty does not exacerbate knee joint pain and effusion despite a substantial increase in muscle strength.

Original Research

No Exacerbation of Knee Joint Pain and Effusion Following Preoperative Progressive Resistance Training in Patients Scheduled for Total Knee Arthroplasty: Secondary Analyses From a Randomized Controlled Trial

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Thank you for your attention

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