



# Blood flow restricted exercise for IBM

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## Metabolic milieu in muscle

- Lactate is produced as a product of energy consumption in the muscle (the mitochondria).
- One study showed that individuals with established PM/DM had abnormally high lactate levels in blood following an incremental exercise bout compared to healthy controls indicating lower aerobic capacity locally in the muscle.
- Another study showed that there was no difference in lactate levels locally in muscle after an incremental exercise bout compared to healthy controls, but that the group of patients had markedly lower exercise capacity and whole-body aerobic capacity.
- Other factors contributing to muscle weakness could be: Lower levels of phosphocreatine in rest and during exercise, lower numbers of capillaries, swollen capillaries expression pro-inflammatory cytokine interleukin 1.

## Why exercise with restricted blood flow?

- At least as effective as high.load (60-100 of 1 repetition maximum) resistance training to improve muscle strength and muscle mass in young and older adults (Nielsen JL et al. J Physiol 2012, Takarada Y et al. J Appl Physiol 2000)
- Blood flow is restricted by a cuff to generate an ischaemic environment in the muscle which combined with exercise favours an anabolic response in the myofibers
- Lower-load BFR exercise can produce skeletal muscle growth with a lower mechanical strain on muscles, tendons and joints – implication for use in myositis
- BFR exercise has been evaluated in 2 case reports and one randomized controlled trial in IBM and in one small, open study in PM/DM

## Case report 1 (*Jørgensen a et al. Clin Physiol Funct Imaging 2017*)

- One man with IBM (diagnosis duration of 5 years, longer history of muscle weakness)
- A cuff was placed on the proximal parts of the thigh and connected to a computerized pneumatic system ensuring a constant preassure of 100 mmHg
- Leg press training was performed in sets on about 25 repetition maximum (30-35% of maximal strength) with 45 seconds of rest in-between (4-5 minutes of BFR exercise)
  - Encouraged to perform repetitions to exhaustion. If 15 or more repetitions were performed in the second set, extra loads were applied at the next exercise session



## Case report 1 (*Jørgensen a et al. Clin Physiol Funct Imaging 2017*)

- For isolated quadriceps exercise constant loads of 2.5 kg were used to ensure exercise through the whole range of motion
- Cuffs were also placed on the proximal part of the calf during calf raising, 25 repetitions/set.
- Isometric max voluntary contraction + 84%, Dynamic muscle strength unchanged
- Single leg muscle power + 48% in the weaker leg, unchanged in stronger leg
- Maximal speed over 10 meter walk + 19%, no changed in TUG



# Case reports BFR exercise in IBM

- One man with IBM exercise twice a week for 12 weeks with 70% restricted blood flow on 30% of 1 repetition maximum. (*Gualano B et al. Med Sci Sports Exerc 2010*)
  - + 16 % in quadriceps strength
  - + 60 % in Timed-up and Go (TUG)
  - Subjective improvements in quality of life
  - + 4.7% increased cross-sectional area of muscle fibers
  - Increased mRNA expression of mechanogrowth factor associated with muscle hypertrophy



## Randomized controlled trial – (*Jørgensen A et al Scand J Rheumatol 2018*)

- 22 patients with IBM were randomized to BFR exercise twice a week for 12 weeks or to a non-exercising control group
  - Symptom duration 8 years, mean age 68
  - Inclusion criteria: Able to walk without ass device (Could be using a cane to walk in dialu life)
  - Exclusion criteria: history of deep vein trombosis, pulmonary embolism or known peripheral ischeamic disease, severe heart/lung disease, uncontrolled hypertension

## Exercise protocol

- Leg press, isolated knee extension, calf raise, dorsi flexion, and knee flexion (introduced at week 4)
- Unilateral exercise in three sets of 25 repetition maximum, adding a fourth set from week 9
- Cuff placed proximal on the thigh with maintained cuff pressure of 110 mmHg



# Results

- Two participants in BFR group withdrew (severe fatigue from exercise, accidental fall probably related to the exercise)
- No difference between groups, or within-groups in self-reported physical function assessed by primary outcome SF-36 physical function.
- Significant improvement in IBM Functional Rating Scale in BFR-group
- **BFR group improved 5.8% in quadriceps strength compared to control group declining 9.2% over 3 months – statistically significant difference in change between groups**
- Both groups improved similarly in physician global disease activity and damage
- CK unchanged (tendency towards increase) in BFR group, a small reduction in control group
- One woman improved substantially in most measures – shortest disease duration

# Discussion

- Variation in exercise response within the group of IBM
- BFR may have a protective effect on muscle strength – helping to minimize longterm progression of loss of muscle function
- The IBM Functional rating scale could be a more sensitive measure of physical function than the SF-36 physical function subscale
- Further studies are needed to evaluate effects of exercise initiated early after diagnosis
- The reduced disease activity and damage in both groups could be due to intratester variability
- Low number of patients – study not fully powered – there may have been effects by the BFR-training not captured in this study
- 12 weeks of exercise might have been too short duration
- Standard BFR program might have been too strenuous for some participants

## Take home message

- Although no large improvements in muscle strength was achieved in the randomized controlled trial – results highlights **importance of exercising to maintain strength in comparison with the major decline in muscle strength in the non-exercising control group**
- Symptom- and diagnosis duration of importance to exercise response
- Blood flow restricted exercise might not be feasible in clinical- or community setting
- Further studies are needed to explore what type of BFR exercise protocol is most beneficial and also to study muscle tissue response

Thank you for listening!



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