Isometric exercise promotes arteriogenesis in rats after myocardial infarction

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Supplementary Data

Supplementary Fig. 1 Transmural MI induction in rats by LAD ligation. A: The apex area of the heart at the preoperative stage. B: The apex area of the heart after LAD ligation. C: ECG of Pre- and post-LAD ligation. The top panel shows preoperative ECG; the bottom panel depicts altered ECG 0 minutes post-LAD ligation. MI: myocardial infarction; IE: isometric exercise; LAD: left anterior descending artery.

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A

SO group
- Anesthesia and ventilator support
- Thoractomy
- Sham ligation
- Conventional feeding, sham operation
- Suture and antibiotics

MI group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, myocardial infarction
- Suture and antibiotics

IE group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, IE training
- Suture and antibiotics

Sampling at endpoint

B

SO group
- Anesthesia and ventilator support
- Thoractomy
- Sham ligation
- Conventional feeding, sham operation
- Suture and antibiotics

MI group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, myocardial infarction
- Suture and antibiotics

IE group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, IE training
- Suture and antibiotics

Inhi-MCP group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, IE training+leflunomide (ig, 10 mg/kg·day)
- Suture and antibiotics

Inhi-FGF group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, IE training+formononetin (ig, 100 mg/kg·day)
- Suture and antibiotics

Inhi-MCP/FGF group
- Anesthesia and ventilator support
- Thoractomy
- Ligation of LAD
- Conventional feeding, IE training+leflunomide (ig, 10 mg/kg·day)+formononetin (ig, 100 mg/kg·day)
- Suture and antibiotics

Sampling at endpoint

(Continued)
**Supplementary Fig. 2** The experimental protocol used to investigate the effects, protocol and mechanisms of IE training. A: Preliminary exploration of the effects of IE training on arteriogenesis in rats after acute myocardial infarction: 1) the sham-operated group (SO, $n=6$), received thoracotomy only; 2) the myocardial infarction group (MI, $n=6$), received MI modeling only; 3) IE training group (IE, $n=6$), received 20 times/day with 100% load for eight weeks. B: Exploration of the mechanisms of IE training: 1) the sham-operated group (SO, $n=6$), received thoracotomy only; 2) the myocardial infarction group (MI, $n=6$), received MI modeling only; 3) IE training group (IE, $n=6$), received 20 times/day with 100% load for eight weeks; 4) MCP-1 inhibitor group (Inhi-MCP, $n=6$), received MI modeling, IE training and intragastric administration of leflunomide (MCP-1 inhibitor) for 10 mg/(kg·day); 5) FGF-2 inhibitor group (Inhi-FGF, $n=6$), received MI modeling, IE training and intragastric administration of formononetin (FGFR-1 inhibitor) for 100 mg/(kg·day); 6) MCP-1 and FGF-2 inhibitor group (Inhi-MCP/FGF, $n=6$), received MI modeling, IE training and intragastric administration of leflunomide and formononetin. C: Optimization of the IE training protocol: 1) the sham-operated group (SO, $n=6$), received thoracotomy only; 2) the myocardial infarction group (MI, $n=6$), received MI modeling only; 3) low-intensity IE training group (LIIE, $n=6$), received 20 times/day with 50% load for eight weeks of IE training; 4) moderate-intensity IE training group (MIIE, $n=6$), received 20 times/day with 75% load for eight weeks of IE training; 5) high-intensity/ moderate-frequency/ moderate-duration IE training group (HIIE/ MFIE/ MDIE, $n=6$), received 20 times/day with 100% load for eight weeks of IE training; 6) low-frequency IE training group (LFIE, $n=6$), received 10 times/day with 100% load for eight weeks of IE training; 7) high-frequency IE training group (HFIE, $n=6$), received 30 times/day with 100% load for eight weeks of IE training; 8) short-duration IE training group (SDIE, $n=6$), received 20 times/day with 100% load for four weeks of IE training; 9) long-duration IE training group (LDIE, $n=6$), received 20 times/day with 100% load for twelve weeks of IE training. SO: sham-operation; MI: myocardial infarction; IE: isometric exercise; MCP-1: monocyte chemoattractant protein-1; FGF-2: fibroblast growth factor-2; Inhi-MCP: MCP-1 inhibitor; Inhi-FGF: FGF-2 inhibitor; Inhi-MCP/FGF: MCP-1 and FGF-2 inhibitor; LAD: left anterior descending artery; ig: intragastrically, LIIE: low-intensity isometric exercise; MIIE: moderate-intensity isometric exercise; HIIE: high-intensity isometric exercise; LFIE: low-frequency isometric exercise; MFIE: moderate-frequency isometric exercise; HFIE: high-frequency isometric exercise; SDIE: short-duration isometric exercise; MDIE: moderate-duration isometric exercise; LDIE: long-duration isometric exercise.
Supplementary Fig. 3  IE training model. The arrow indicates the sandbag used to adjust the training load.