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The expression and roles of lncRNAs in the regeneration of skeletal muscle contusion

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Objective In recent years, Accumulating evidence from myoblast differentiation in vitro, cardiotoxin (CTX)-mediated injury or mdx mice suggested that some lncRNAs such as Malat1, H19, linc-MD1, linc-YY1, Sirt1 AS and lnc-mg may modulate myogenesis and muscle regeneration. However, the change of lncRNAs in skeletal muscle contusion and their possible roles are still unclear. We hypothesize that the lncRNAs may be involved in the repair of skeletal muscle contusion.
Methods Forty C57BL/6 male mice were randomly divided into two groups, uninjured control group (group C) and muscle contusion group (group S). The mice of group S suffered from contusion injury. All the mice were killed to harvest gastrocnemius at 3, 6, 12 and 24 days post-injury. The gene expression were detected by PCR technique. Gastrocnemius were stained with H & E to evaluate the general morphology. Data were analyzed by One-way analysis of variance, with statistical significance being set at $p \leq 0.05$.
Results The expression levels of linc-MD1 and Sirt1 AS were significantly higher than that of the uninjured control group at 3, 6 and 12 days post-injury ($p<0.01$). And Malat1 was highly expressed in the skeletal muscle of the muscle contusion group at 3 days post-injury and continuously up-regulated at 6 days ($p<0.01$). Moreover, linc-YY1 and H19 were all elevated significantly at 6 days (all $p<0.01$), but their gene expression levels did not change significantly at 3, 12 and 24 days post-injury, as compared to the uninjured control group. Furthermore, lnc-mg mRNA level did not change significantly in the whole process of regeneration after muscle contusion except the time point of 12 days post-injury which decreased significantly ($p<0.01$). The expression of myogenic regulatory factors (MyoD, myogenin, myf5, myf6) were studied, they were all elevated significantly at 3 and 6 days (all $p<0.01$; except myogenin), and returned to normal at 24 days post-injury, as compared to the uninjured control group. Meanwhile, Pearson correlations showed that there was an correlation between lincRNAs and myogenic regulatory factors mentioned above.
Conclusions The expression of myogenic regulatory factors increased significantly after muscle contusion. Meanwhile, varieties of lncRNAs (Malat1, H19, lnc-mg, linc-MD1, linc-YY1, Sirt1 AS) were also up-regulated. Moreover, there was correlation between lncRNAs and myogenic regulatory factors for skeletal muscle regeneration. These results suggest that lncRNAs may play important roles in the regeneration of skeletal muscle contusion.