Improved Random Component Viability of Axial Skin Flap through the Use of Human Adipose Derived Stem Cells

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Abstract

**Purpose:** Flap necrosis caused by inadequate blood supply and inflammation is a common postoperative complication in reconstructive surgery.\(^1\) Lu et al. claimed adipose-derived stem cells increase the viability of random pattern skin flaps via subcutaneous injection.\(^2\) The purpose of this study is to examine if administration of human adipose-derived stem cells via local intra-arterial injection could improve survival of the random component of axial skin flap by animal study.

**Materials and Methods:** Human adipose-derived stem cells were isolated from a healthy 48 year-old woman by liposuction with patient consent and expanded ex vivo as standard protocol. After the elevation of axial epigastric flap in nude mice, human adipose-derived stem cells were then injected via right femoral artery (Figure 1) in different concentration (group A=1x10\(^3\), group B=1x10\(^4\), group C=1x10\(^5\)). The control group received 0.2 ml phosphate-buffered saline solution. After local injection, right superficial epigastric vessels were ligated to create unipedicle skin flap with random extension. The percentage of necrotic area was measured at postoperative day 7 for evaluation of flap viability. Specimens were also harvested for histologic analysis and ELISA assay.

![Image](image.png)

**Figure 1.** Human adipose-derived stem cells were then injected via right femoral artery.

**Results:** Human adipose-derived stem cells led to a statistically significant increase in random component viability in both group A and group B compared with the control (Figure 2), especially group B (1x10\(^4\)). Histologic examination also showed some of the endothelial cells were stained positively for anti-human CD31. Moreover, ELISA assay revealed the amount of TNF- \(\alpha\) decreased in group A, B and C compared with the control.
Figure 2. Human adipose-derived stem cells led to a statistically significant increase in random component viability in both group A and group B compared with the control.

Conclusion: Human adipose-derived stem cells increase the viability of random component of axial skin flap via local intra-arterial injection. The mechanism of improved viability of skin flap might be the direct differentiation of human adipose-derived stem cells into endothelial cells or inhibited inflammation process via TNF-α.

References

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