ACCELERATION OF SURGICAL ANGIOGENESIS IN NECROTIC BONE WITH A SINGLE INJECTION OF FIBROBLAST GROWTH FACTOR-2 (FGF-2)

*Nakamae, A; *Sunagawa, T; *Ishida, O; *Suzuki, O; *Hachisuka, H; *Yasunaga, Y; *Ochi, M
+*University of Hiroshima, Hiroshima, Japan

[Purpose]
This study aims to accelerate the rate and extent of neoangiogenesis in necrotic bone by combining vascular bundle implantation and FGF-2 administration.

[Methods]
Twenty Japanese white rabbits, weighing 3.0 to 3.5 kg, were used in this study. A portion of rabbit iliac crest bone was removed as a free bone graft and frozen for 5 minutes in liquid nitrogen to ensure complete cellular necrosis. A narrow hole was created in the bone and the graft was placed in the proximal thigh. In group 1, FGF-2 was injected into the hole at a single dose of 100 microgram, and the saphenous artery and its venae comitantes were passed through the hole of the bone. In group 2, injection of saline into the hole and vascular bundle implantation was used as a control. Two sampling point (1 and 2 weeks postoperatively) were used in both groups. Neovascularization was visualized by infusing a colored microangiographic material. Newly formed vessel density and average length was evaluated. The vessel density was calculated as the ratio of the size of the area occupied by newly formed vessels divided by the total bone sample size. The experiments were made according to the stipulations of the Ethics Committee for Experimental Animals of Hiroshima University. The Mann-Whitney U test was used for statistical analysis. Significance was set at p < 0.05.

[Results]
Neovascularization was observed along the implanted vascular bundle (Fig. 1). The vessel density gradually increased from 1 week to 2 weeks in both groups. At 1 week after surgery, the vessel density in group 1 was significantly higher than that in group 2. At 2 weeks after surgery, the vessel density in group 1 was also significantly higher than that in group 2 (Fig 2). The length of vessels at 1 week after surgery in group 1 was significantly higher than that in group 2. At 2 weeks after surgery, the mean of the vessel length in group 1 was also significantly higher than that in group 2 (Fig. 3).

[Conclusions]
A local single injection of FGF-2 improved surgical angiogenesis in necrotic bone in this study. As FGF-2 is also known to have an osteogenic function, the combination of vascular bundle implantation and FGF-2 administration may contribute to the treatment of avascular necrosis of bone.

Fig. 1 A
Fig.1 B

Fig. 1
The result of microangiography. At 2 weeks after surgery of group 1 (FGF-2) (A), and group 2 (control) (B). Neovascularization was observed along the implanted vascular bundle in both groups.

Fig. 2
The density of newly formed vessels. At both 1 week and 2 weeks after surgery, the density of vessels in group 1 was significantly higher (p < 0.05) than that in group 2.

Fig. 3
The length of newly formed vessels. At both 1 week and 2 weeks after surgery, the length of vessels in group 1 was significantly higher (p < 0.05) than that in group 2.