PROPER METHODS FOR COLLAGENASE INDUCED TENDINOPATHY ANIMAL MODEL

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Introduction

- ❖ The therapeutic advancements are limited for tendinopathy even though it is a common and several new therapeutic methods were tried.
- ❖ To prove the effects of new therapeutic methods, several animal models are used.
- ❖ Collagenase induced tendinopathy animal models have been used in several studies. However, most of them just describes total injection units without other information such as injection approach, injection volume, collagenase concentration. Collagenase injury model has been used for tendinopathy model. However, most of studies did not describe the precise protocols.

Purpose

- ❖ The objective of this study is to establish proper methods for collagenase induced tendinopathy model in rat.

Method

- ❖ We injected type I collagenase to Achilles tendon of Eight-week old male Sprague-Dawley rats.
- ❖ Collagenase injection was performed after skin incision and plantaris tendon removal.
- ❖ We controlled following collagenase injection conditions.
 - ◆ total injection volume (5, 10, 20 ul) and total collagenase units (62.5 UI, 125 UI, 250 UI)
 - ◆ injection concentration (62.5 UI/ 10ul)
 - ◆ injection site
 - ◆ one site in one Achilles tendon
 - ◆ two site in one Achilles tendon (one site in each two tendon strip in one tendon)
- ❖ General appearance observation, Hematoxylin and eosin staining were performed at 2 weeks after collagenase injection.

Results

- ❖ Generally, all collagenase injected tendons were swollen.
- ❖ Injection of 62.5 units/ 10ul of type I collagenase for each strip of two Achilles tendon strips, total 125 unit in 20ul, demonstrated most homogeneous and adequate microscopic tendinopathic feature such as loss of normal tendon fibrillation.
- ❖ Injection of both strip in Achilles tendon made more homogeneous tendon damage than injection of one strip demonstrating relatively more normal tendon structure.
- ❖ The homogeneity of tendinopathy was not improved with injection of more than 125 unit of collagenase.
- ❖ More than 10ul injection in one tendon strip is not appropriate due to profuse leakage of injection materials.

Fig 1. Control group. H&E staining of normal rat Achilles tendon.
Normal tendon fibrils are aligned.

Fig 2. H&E staining of single injection of 62.5UI for one strip. Injured one strip lost direction and tendon get thicker. Another strip was slightly affected and kept directional.

Fig 3. H&E staining of double injection of 62.5UI for each strip. Most of tendon area was damaged evenly and lost direction.

Conclusion

- ❖ The injection with 10ul of 62.5UI collagenase type I for each strips of rat Achilles tendon, total 125 UI in 20ul under direct vision is effective way to make tendinopathy rat model.
- ❖ These precise methods will be helpful in research fields of tendon injury and regenerative medicine.