再生医療

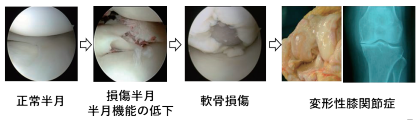
ヒト臍帯組織由来間葉系幹細胞と アテロコラーゲン半月板再生誘導材を用いた半月板再生医療の開発

プロジェクト責任者	大阪大学大学院医学系研究科　健康スポーツ科学（スポーツ医学）
	教授　中田　研

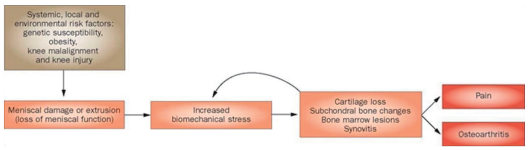
プロジェクト概要

膝半月板の損傷や機能不全は若年者スポーツ外傷と中高齢者の関節変性の幅広い年齢層でみられ、疼痛や関節運動機能障害をきたすが、身体活動低下から健康寿命となる変形性膝関節症発症の重大要因となる。手術適応例では、現状では切除術が多く（日本76%、米国94%）、機能回復のための新規医療が近年世界的に求められているが未解決である。

本研究課題では、ヒト臨床研究で有用性が示された高強度アテロコラーゲン半月板再生誘導材と、ヒト組織バンクが既存し利用可能性が高い臍帯組織より間葉系幹細胞を単離培養し播種した三次元複合体を半月板損傷部に移植する自家、および、他家細胞を用いた新規半月板再生医療の開発を目指す。

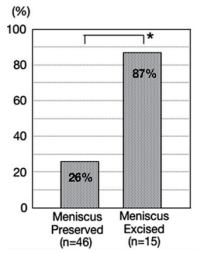


Fairbank T. J. *JBJS* 1948
Tapper E. M. et al. *JBJS* 1969
Henning C. E. et al. *Clin Sports Med* 1985



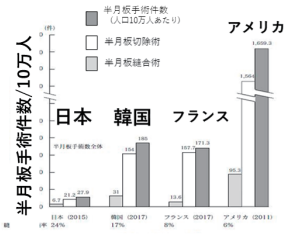
The “meniscal pathway ” to osteoarthritis

Englund M, et al. *Nat Rev Rheumatol.* 2012



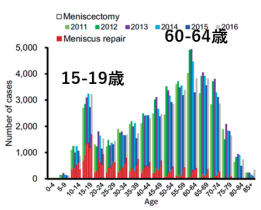
半月板切除術後の
二次性膝OAの発生

Nakata K et al.,
Arthroscopy 2010



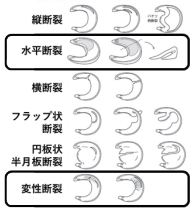
日本の半月板手術件数は
諸外国と比べて少ない

中田 研 ほか
整形・災害外科 2021



手術患者の年齢は二峰性で
壮年では切除術が多い

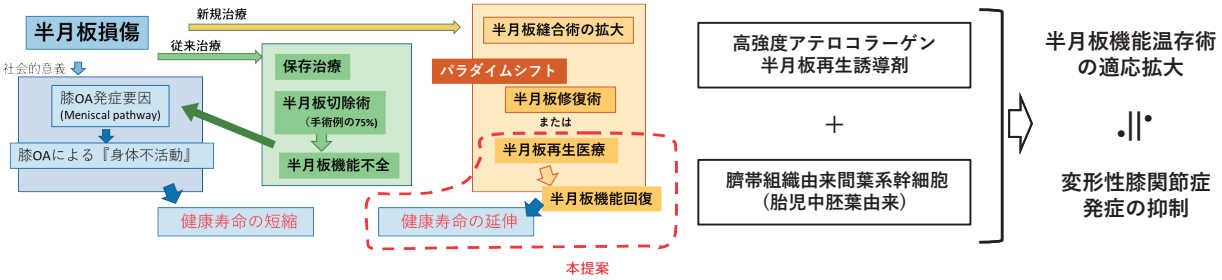
Kawata M et al.,
PLOS ONE 2018



水平断裂・変性断裂は
温存術の対象になりにくい

中田 研 ほか
関節外科 2017

1.標準的治療（半月板切除術）では、高頻度に続発性変形性膝関節症が発症する。
2.続発性変形性膝関節症の発症を抑制するために、半月板温存術の割合を増やす必要がある。



対象疾患：従来機能温存術の対象とならない大きな欠損または強い変性を伴う損傷半月板
特許情報：特願2022-118591（2022年7月26日）
技術の特徴：臨床研究で有用性が示された高強度アテロコラーゲン半月板再生誘導材と
ヒト組織バンクが既存で利用可能性が高い臍帯組織由来間葉系幹細胞による複合体の活用
市場性、開発における課題：臨床応用前には大型実験動物による検討が必要

Regenerative medicine

Development of Meniscus Regeneration Therapy Using Human Umbilical Cord Tissue-Derived Mesenchymal Stem Cells and Atelocollagen Meniscus Regeneration Material

Principal Investigator

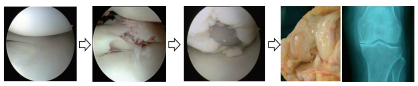
Department of Health and Sport Sciences, Medicine for Sports and Performing Arts, Graduate School of Medicine, Osaka University

Professor Ken NAKATA

Project Outline

Knee meniscus injuries and dysfunction are seen in a wide range of age groups, including young people with sports injuries and middle-aged and elderly people with joint degeneration, causing pain and joint movement dysfunction, and are a significant factor in the development of knee osteoarthritis, which leads to a decline in physical activity and healthy life expectancy. In cases where surgery is indicated, resection is currently the most common treatment (76% in Japan, 94% in the U.S.), and novel medical treatments for functional recovery have been sought worldwide in recent years.

In this research project, we aim to develop a novel regenerative medicine for the meniscus by transplanting a three-dimensional composite of a high-strength atelocollagen crescent regeneration inducing material, which has been shown to be useful in human clinical studies, and mesenchymal stem cells isolated and cultured from cord tissue, which is highly available due to the existence of a human tissue bank, into the damaged area of the meniscus. The aim of the project is to develop a novel regenerative medicine for meniscus using autologous and allogeneic cells.



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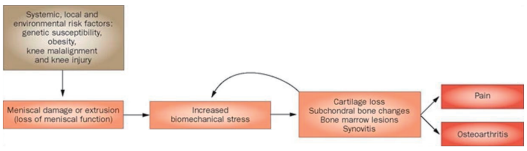
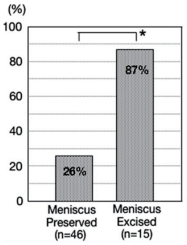


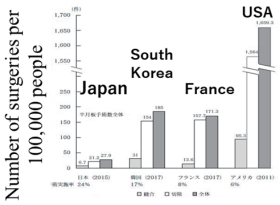
The "meniscal pathway" to osteoarthritis

Englund M, et al. *Nat Rev Rheumatol.* 2012



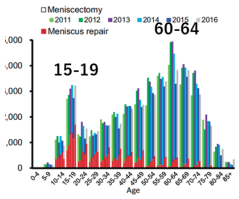
Occurrence of secondary knee OA after meniscectomy

Nakata K et al., *Arthroscopy* 2010



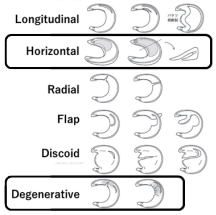
The number of meniscus surgeries in Japan is small compared to other countries

Nakata K et al., *Seikei・Saigaigeka* 2021



Age of surgical patients is bimodal, with resection more common in mature age

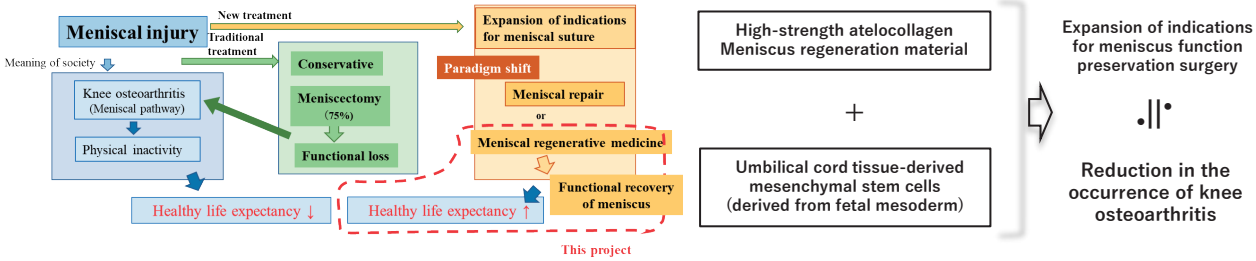
Kawata M et al., *PLOS ONE* 2018



Horizontal and degenerative tears are less likely to be eligible for preservation surgery

Nakata K et al., *Kansetsugeka* 2017

1. Standard treatment (meniscectomy) results in a high incidence of secondary knee osteoarthritis.
2. The rate of meniscus-preserving surgery should be increased to reduce the incidence of secondary knee OA.



Target Disease: Damaged meniscus with large defects or strong degeneration not amenable to conventional function-sparing surgery.

Patent information: Patent Application 2022-118591 (filed July 26, 2022).

Technology Features: Utilization of a composite of high-strength atelocollagen meniscus regeneration material that has been shown to be useful in clinical trials and umbilical cord tissue-derived mesenchymal stem cells that are highly available due to human tissue bank.

Marketability/developmental issues: Large-scale animal studies are required before clinical application.