Semi-synthetic collagen

Semi-synthetic collagen refers to collagen-based materials that are partially derived from natural collagen sources and partially modified or enhanced through synthetic processes. This combination allows for the manipulation and customization of collagen properties to suit specific applications.

The process of creating semi-synthetic collagen typically involves isolating natural collagen from a biological source, such as animal tissues, and then subjecting it to various modifications. These modifications can include chemical treatments, enzymatic reactions, cross-linking, or incorporating synthetic components to enhance certain properties or functionalities of the collagen material.

Semi-synthetic collagen materials have been explored for a range of applications. In the biomedical field, they have been used in tissue engineering and regenerative medicine to develop scaffolds that mimic the extracellular matrix and promote cell growth and tissue regeneration. By modifying the collagen structure, researchers can control factors such as mechanical strength, biodegradability, and cell adhesion properties.

In the cosmetic industry, semi-synthetic collagen has been used in skincare products and dermal fillers. These materials can be designed to have improved stability, longer-lasting effects, and better compatibility with the human body compared to natural collagen.

It's important to note that while semi-synthetic collagen materials offer potential benefits and versatility, their development and use are still areas of ongoing research. Safety, efficacy, and regulatory considerations are crucial factors that need to be carefully evaluated before these materials are widely adopted for various applications.

A prospective comparative study was conducted at the neurosurgery departments of different hospitals in Peshawar and Faisalabad. Patients were divided into two groups: A (autologous graft) and B (semi-synthetic graft). Dura graft autologous was applied in one group of patients with supratentorial brain surgery. Fascia lata was used, harvested from the lateral thigh, 3 to 5 cm long incision at the junction of the upper and middle one-third of the upper leg. A bone flap was implanted in the subcutaneous region in the abdominal part. Perioperative antibiotics were given to all the patients, and surgical drains placed intraoperatively were removed after 24 hours of surgery. In the second group, semi-synthetic dura grafts of 2.5×2.5 cm and 5×5 cm 7.5×7.5 cm sizes were used. Statistical analysis was performed using SPSS version v.20. Student's t-test was performed for the two groups to compare categorical variables, and the data were considered statistically significant at p > 0.05.

In this study, 72 patients of both genders were recruited. We observed that the Semi-synthetic collagen matrix had less surgical time. The mean difference in surgical duration was observed as 40 minutes. However, both groups reported statistically significant differences in terms of surgical duration (< 0.001). No case of infection was reported in both groups. The overall mortality ratio was 12%. Two male deaths were recorded due to cardiovascular disorders, while one death of a 42-year male was also recorded.

Based on the above findings, it may be concluded that using a semi-synthetic collagen substitute for dura repair is a simple, safe, and effective alternative to the autologous graft for dura repair in dura defects ¹⁾

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Khan Z, Pervez S, Sharafat S. Comparative analysis of dural substitute autologous vs. semisynthetic collagen-based dura graft. Eur Rev Med Pharmacol Sci. 2023 May;27(9):3887-3891. doi: 10.26355/eurrev_202305_32294. PMID: 37203812.

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