Surgicel

One of the most widely applied absorbable hemostatic materials.

Manufactured by Ethicon Inc. of Johnson & Johnson Medical Limited.

Surgicel™ is an oxidized cellulose polymer, with polyglucuronic glucuronide as its effective functional unit. Blood absorption initiates within 1 day after its application, but complete absorption requires 4 to 8 weeks [1].

Neurosurgical hemostasis can be performed with bipolar coagulation and with the support of several dedicated biomaterials including oxidized regenerated cellulose (ORC; e.g., Surgicel®, Johnson & Johnson, New Brunswick, NJ, USA). Oxidized regenerated cellulose is a sterile absorbable fibrous biomaterial that has become a major local hemostatic agent thanks to its ease of use, favorable biocompatibility and bioabsorption characteristics.

Extensive clinical evidence has shown that the application of Surgicel™ during cerebral surgery rapidly promotes blood clotting and effectively controls bleeding. Moreover, Surgicel™ has been demonstrated to display superior tissue compatibility compared to other resorbable hemostatic agents [2] [3] [4].

Complications

Some postoperative issues associated with its use, such as allergic reaction, seroma, foreign-body reaction with compressive neuropathies and misdiagnosis during follow-up, have been reported. These complications could compromise clinical outcomes with a negative impact on patient quality of life and sometimes require risky major surgical procedures. An understanding of the specific properties of ORC combined with adequate surgical expertise and compliance with some basic rules are needed to optimize clinical outcomes and minimize postoperative issues [5].

Compared to other hemostatic substances, Surgicel™ has an especially high level of tissue compatibility; however, occasional cases of foreign body reactions, such as abscesses, inflammation, and giant-cell granuloma, have been reported with its use [6] [7] [8] [9] [10].

Interestingly, in each case of Surgicel™-induced giant-cell granuloma, the granuloma was initially misdiagnosed as a tumor. For example, Tefik et al. reported a case of Surgicel™-related granuloma in a laparoscopic kidney tumor resection surgery that was misdiagnosed as tumor recurrence [11].

Gao et al. reported a case of Surgicel™-related granuloma that was misdiagnosed as a tumor 1 month after hysterectomy and right oophorectomy [12]. These previous cases of granuloma formation in organs outside the nervous system were ultimately found to be due to chronic inflammatory reactions. Overactivated giant cells assembled around the Surgicel™, forming the chronic giant-cell granuloma [13].

A similar immune-related mechanism may have contributed, at least in part, to the Surgicel™-related granuloma observed in the brain of our patient. However, a Surgicel™-related granuloma in the brain will have distinctive features from those involving other organs because the blood–brain barrier

functions to prohibit giant cell infiltration and assembly in the brain [14].

Giant cell granuloma

Although low, the risk of developing Surgicel™-related granuloma after surgery indicates a need for caution in applying Surgicel™, especially when it is used solely for the purpose of achieving a hemostatic effect. However, the risk of granuloma may be reduced by removing the unabsorbed Surgicel™ after the hemostatic effect has been achieved, or by reducing the amount of Surgicel™ applied. When a tumor-like space-occupying lesion is observed in the intracranial surgery bed after surgery employing Surgicel, the rare possibility of Surgicel™-related granuloma should be considered [15].

1)
Potter MJ, Chauhan A, Rowe D. Surgicel: an effective tool to avoid free flap pedicle kinking in the head and neck. ANZ J Surg. 2013;12:95–96. doi: 10.1111/ans.12035.
2)
Hadi HA, Maw A, Hay DJ. A simple technique to control iatrogenic solid organ injury haemorrhage. Surgeon. 2004;12:339–340. doi: 10.1016/S1479-666X(04)80033-7.
3)
Ribalta T, McCutcheon IE, Neto AG, Gupta D, Kumar AJ, Biddle DA, Langford LA, Bruner JM, Leeds NE, Fuller GN. Textiloma (gossypiboma) mimicking recurrent intracranial tumor. Arch Pathol Lab Med. 2004;12:749–758.
4)
Scarff JE, Stookey B, Garcia F. The use of dry oxidised cellulose as a primary hemostatic agent in neurosurgery. J Neurosurg. 1949;12:304–306. doi: 10.3171/jns.1949.6.4.0304.
5)
Franceschini G. Use of Oxidized Regenerated Cellulose as a Hemostatic Agent in Neurosurgery: Appraisals and Recommendations to Prevent Postoperative Complications and Facilitate Follow-Up. Surg Technol Int. 2021 Feb 16;38:sti38/1397. Epub ahead of print. PMID: 33592670.
6)
Ibrahim MF, Aps C, Young CP, Ibrahim MF, Aps C, Young CP. A foreign body reaction to surgicel® mimicking an abscess following cardiac surgery. Eur J Cardio Thorac Surg. 2002;12:485–494. doi: 10.1016/S1010-7940(02)00333-0.
7)
Concha A, Esteban RJ, Talavera P, Osuna A, Asensio C. Xanthogranulomatous pyelonephritis caused by Surgicel® in a renal allograft. Nephrol Dial Transplant. 1997;12:1509–1511. doi: 10.1093/ndt/12.7.1509.
8)
Azmy AF. Oxidized cellulose haemostat mimicking a possible recurrence of neuroblastoma. BJU Int. 2001;12:295–296. doi: 10.1046/j.1464-410x.2001.02325.x.
9) 11)
Tefik T, Sanli O, Oktar T, Yucel OB, Ozluk Y, Kilicaslan I. Oxidized regenerated cellulose granuloma mimicking recurrent mass lesion after laparoscopic nephron sparing surgery. Int J Surg Case Rep. 2012;12:227–230. doi: 10.1016/j.ijscr.2012.03.001.
10) 12)
Gao HW, Lin CK, Yu CP, Yu MS, Chen A. Oxidized cellulose (Surgicel) granuloma mimicking a primary ovarian tumor. Int J Gynecol Pathol. 2002;12:422–423. doi: 10.1097/00004347-200210000-00015.
13)
Saeidiborojeni HR, Fakheri T, Iizadi B. Intracranial foreign body granuloma simulating brain tumor: a case report. J Res Med Sci. 2011;12:358–360.
14)
Nakamura T, Saito R, Sugiyama S, Sonoda Y, Kumabe T, Tominaga T. Local convection-enhanced

delivery of chemotherapeutic agent transiently opens blood–brain barrier and improves efficacy of systemic chemotherapy in intracranial xenograft tumor model. Cancer Lett. 2011;12:77–83. doi: 10.1016/j.canlet.2011.06.018.
15)
Lin B, Yang H, Cui M, Li Y, Yu J. Surgicel application in intracranial hemorrhage surgery contributed to giant-cell granuloma in a patient with hypertension: case report and review of the literature. World J Surg Oncol. 2014 Apr 21;12:101. doi: 10.1186/1477-7819-12-101. Review. PubMed PMID: 24745805; PubMed Central PMCID: PMC3999730.