



Retention of Nonabsorbable Hemostatic Materials (Retained Surgical Sponge, Gossypiboma, Textiloma, Gauzoma, Muslinoma) After Spinal Surgery: A Systematic Review of Cases Reported During the Last Half-Century

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Key words

- Complication
- Gauzoma
- Gossypiboma
- Muslinoma
- Retained surgical sponge
- Textiloma
- Spinal surgery

Abbreviations and Acronyms

CT: Computed tomography

MRI: Magnetic resonance imaging

PET: Positron emission tomography

RNHMs: Retention of nonabsorbable hemostatic materials

US: Ultrasonography

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INTRODUCTION

In spinal surgery, various nonabsorbable hemostatic materials, including cotton pledgets, surgical sponges, and synthetic hemostatic agents, are used to control intraoperative bleeding.¹ Although only a few cases have been reported in the literature, one of the most common problems that can result after spinal surgery is the retention of nonabsorbable hemostatic materials (RNHMs). RNHMs can represent a surgical sponge (mop or swab), gauzoma, gossypiboma, muslinoma, or textiloma that consists of a cotton matrix surrounded by a foreign body reaction.²⁻⁷ Clinically, a history of surgery, physical examination findings, laboratory results, and the use of a variety

■ **OBJECTIVE:** Retention of nonabsorbable hemostatic materials (RNHMs), that is, retained surgical sponge, gauzoma, gossypiboma, muslinoma, or textiloma, is a rarely seen surgical complication after spinal surgery that may remain asymptomatic for many years and may represent a diagnostic difficulty with associated medicolegal implications.

■ **METHODS:** We performed a systematic review of the English-language literature published between 1965 and 2017, accessed through 4 popular databases. We found a total of 37 articles (24 case reports; 7 image presentations; 5 clinical series, and 1 letter to editor) containing 58 cases of RNHMs located within the spinal canal or around the spinal column after surgery.

■ **RESULTS:** In this study, there were 29 female and 29 male patients from 13 countries, ages ranging from 17 years to 87 years, with initial diagnoses of lumbar or cervical disc herniation, spinal stenosis, or spondylolisthesis ($n = 54$), or spinal tumor ($n = 4$). The interval from the initial surgery to the presentation of RNHMs ranged from 13 days to 40 years, with a mean of 75.9 months. Various imaging techniques such as computed tomography and magnetic resonance imaging were used with histologic study, confirming the presence of RNHMs in the majority of patients with a complete recovery resulting in 93% of patients.

■ **CONCLUSIONS:** RNHMs is an overreported entity in underdeveloped or developing countries, including Turkey and Morocco, with progression occurring over years. RNHMs should be considered in the differential diagnosis of any patient who presents with back pain, spinal cord, or nerve roots symptomatology after spinal surgery.

of appropriate imaging studies may provide suggest the correct preoperative diagnosis, but a definitive diagnosis can be difficult due to their nonspecific nature. A retained foreign body located within the spinal canal or adjacent to the spinal column after surgical intervention is usually a preventable complication that occurs much less often than after surgical interventions in another locations within the body.⁸ In addition to representing diagnostic dilemmas, it is important to recognize that RNHMs may also have medicolegal implications.^{1,9,10} The purpose of this systematic review was to determine the clinical presentation, imaging characteristics, surgical and histologic findings, and medicolegal

ramifications of RNHMs after spinal surgery.

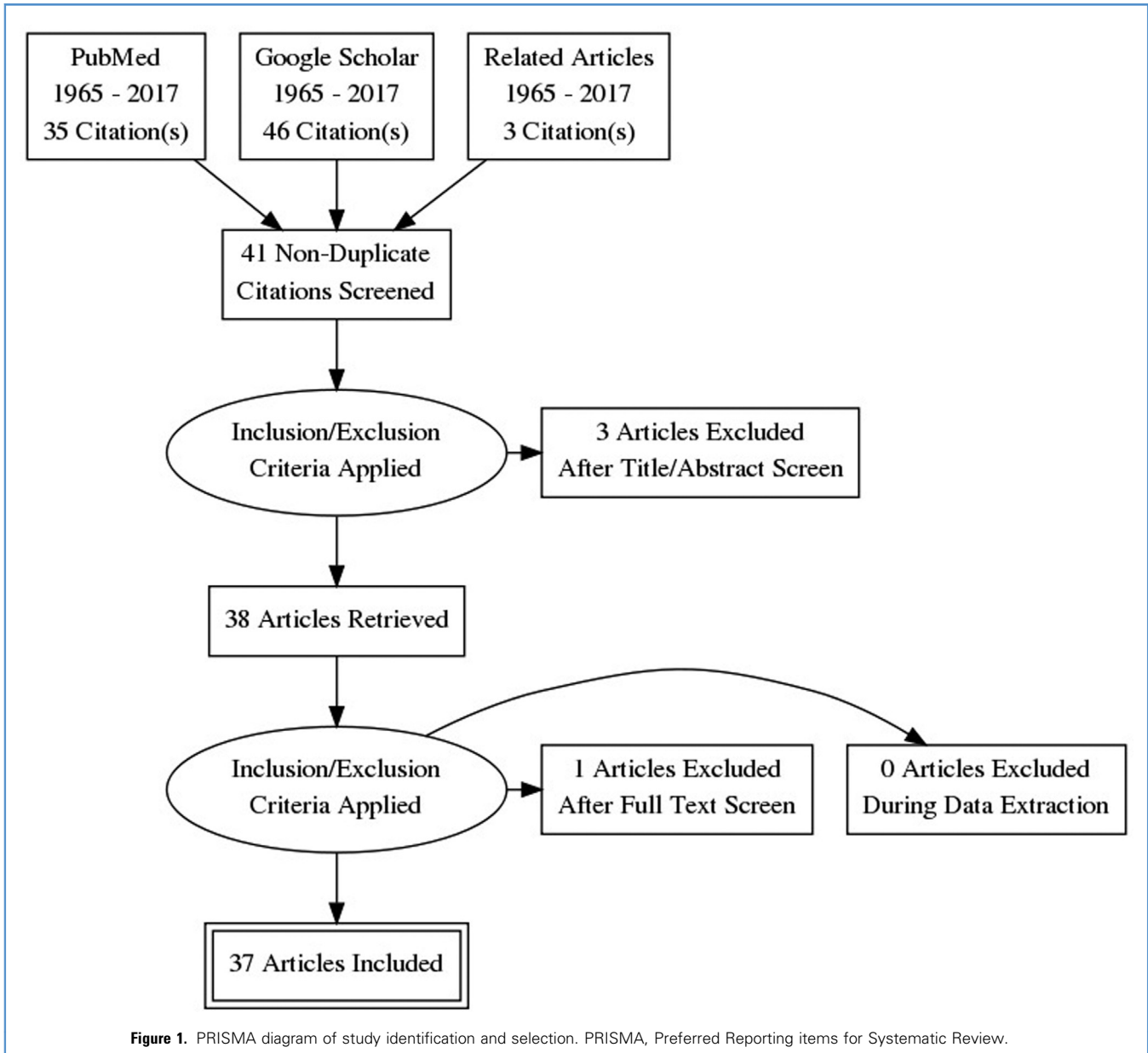
METHODS

Protocol and Registration

This study was conducted according to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses, an evidence-based minimum set of items for reporting in systematic reviews.¹¹ Institutional review board approval was not required for this study.

Search Strategy and Eligibility Criteria

In this comprehensive systematic review, English-language literature published



between January 1965 and December 2017 that included all clinical series, case reports, case illustration, images, or letters reporting case of RNHMs was retrospectively searched in PubMed, Ovid, Cochrane Review, and Google Scholar databases using the key search terms “retained surgical sponge,” “retained surgical swab,” “retained surgical mop,” “gossypiboma,” “textiloma,” “gauzoma,” and “muslinoma.” Cross-referenced sources that were collected from primary sources and relevant articles were included

in this manuscript. Cases with RNHMs located within the spinal canal or around the spinal column were included in the study, with those cases located in other parts of the body being excluded. Furthermore, relevant articles in which foreign materials were only microscopic fragments of surgical patties, swabs, etc., with minimal inflammatory reaction were excluded.¹² The Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram shows our search results and reasons for study exclusion (**Figure 1**).

In this systematic review, a total of 40 articles were identified^{1,2,6,13-49} and reviewed retrospectively (**Figures 1** and **2**). The full texts of all articles published (letter to editor, case report, clinical series, case illustration, interesting images, images, or photo-quiz) were reviewed independently by 2 authors (M.T. and A.A.), and the senior author (A.T.T.) provided a final assessment using strict inclusion and exclusion criteria if there was a disagreement regarding inclusion. Ultimately, the literature search results

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