

Narrative Review & Case Series of Granuloma-Like Reaction After Particulate Steroid Injection: Implications for Epidural Injection

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INTRODUCTION

Corticosteroids are synthetic anti-inflammatory drugs that are commonly used to treat a range of conditions including lumbosacral radicular pain via epidural steroid injections. During epidural spinal injections, corticosteroid is injected into the epidural space surrounding the spinal cord, where it can reduce inflammation and provide pain relief. Particulate corticosteroids, like methylprednisolone and triamcinolone, must undergo hydrolysis, thus lowering their solubility and theoretically lasting longer at the injection site, when compared to non-particulate steroids like dexamethasone. However, there are unique risks and tissue reactions associated with particulate steroid injections. The primary objective of this study is to compare novel observations of epidural granulomatous-like reactions after interlaminar particulate epidural steroid injections (ILPESI) to granulomatous-like reactions previously reported in the literature. To achieve this, we conducted a case series that provided detailed information on the gross anatomical and histological epidural reactions following ILPESI. Subsequently, we compared these findings, with a narrative review of the existing literature concerning granulomatous-like reactions after particulate steroid injections.

METHODS

Case Series

- **Objective:** Case series to analyze changes in epidural space post-ILPESI
- **Participants:** Four consecutive adults with chronic back pain (Figure 1 & 2)
- **Intervention:** Lumbar decompression surgery after failed ILPESI
- **Outcome Measure:** Gross and histologic appearance of ligamentum flavum

Narrative Review

- **Objective:** Compare case series findings to findings in previous literature
- **Strategy:** Studies were identified by searching PubMed MEDLINE, Ovid MEDLINE, EMBASE, and Google Scholar to retrieve all available relevant articles. Publications extending from 1952 to 2023 (Figure 3 & 4).
- **Keywords Used:** particulate corticosteroids, cutaneous reactions, epidural, and injection
- **MeSH terms Used:** injections, steroids, particulate size, epidural and adverse effects.

RESULTS-CASE SERIES

Figure 1: Histology of Ligamentum Flavum post-ILPESI

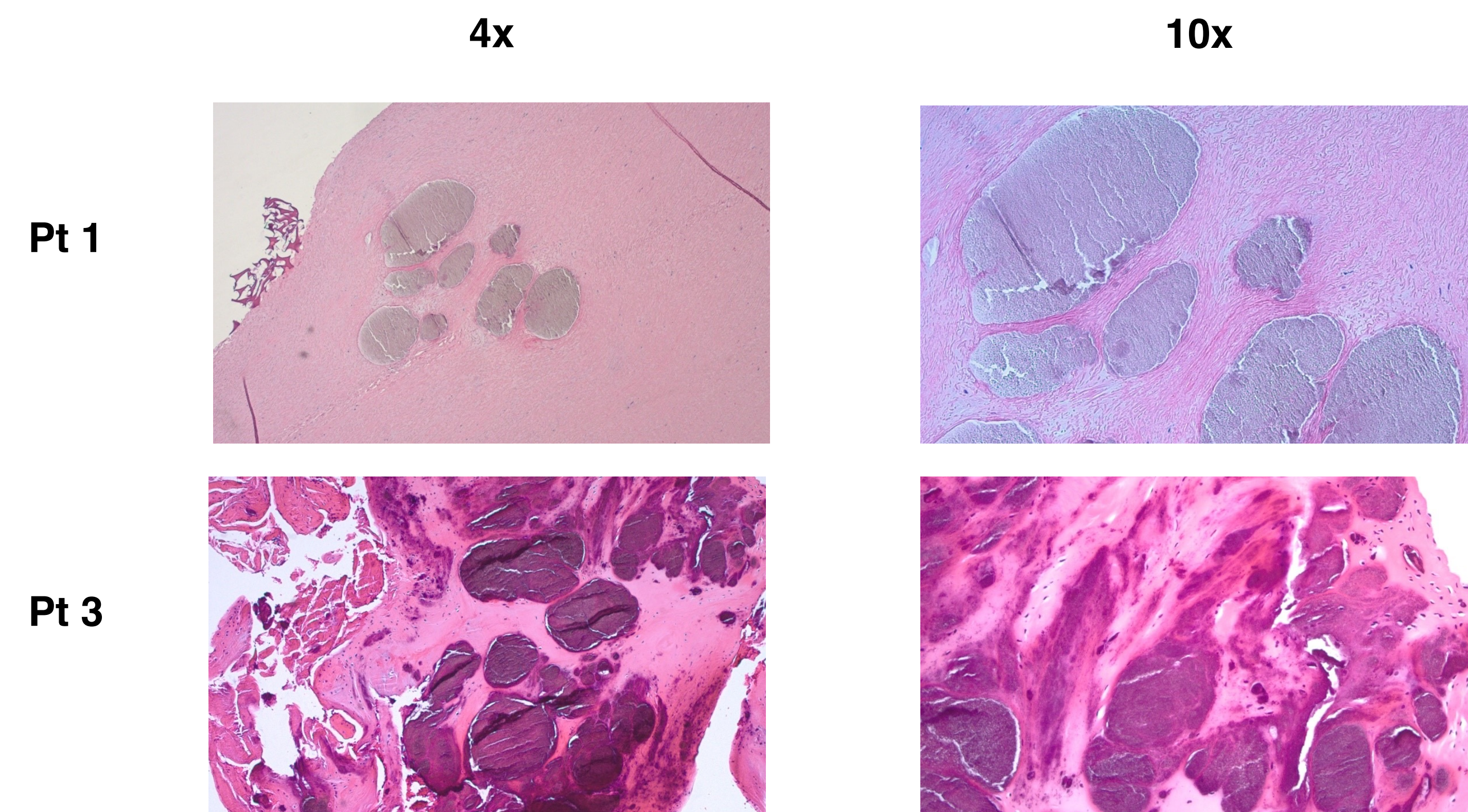
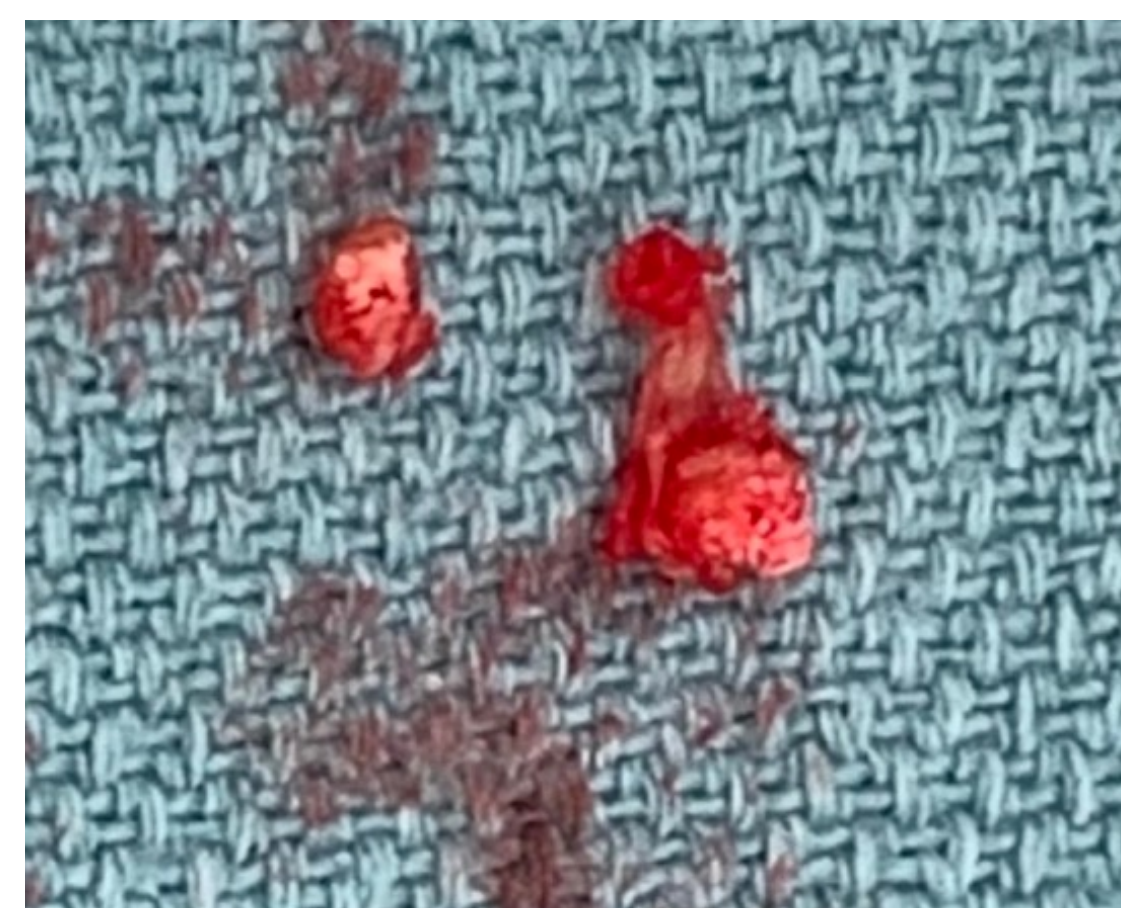


Figure 2: Gross Surgical Specimen Post-ILPESI



- Figure 1 illustrates well-defined acellular granular material in various shapes, segmented by fibrotic tissue. These granular, avascular deposits prompt cellular responses in surrounding tissues, with minor collections of histiocytes, fibroblasts, and lymphocytes nearby but without substantial infiltration. Notably, the deposits do not show autofluoresce with hematoxylin and eosin staining, and eosinophilic leukocytes, mast cells, or giant cells are absent in the cellular reactions. Neovascularization is also absent. There are no unfilled spaces surrounded by faintly stained material, and birefringent crystals are not visible under polarized light.
- Figure 2 depicts small white flecks or white pasty material which is readily apparent associated with the ligamentum flavum or resting on the dura at the site of the injection.

RESULTS-NARRATIVE REVIEW

Figure 3: PRISMA Flowchart

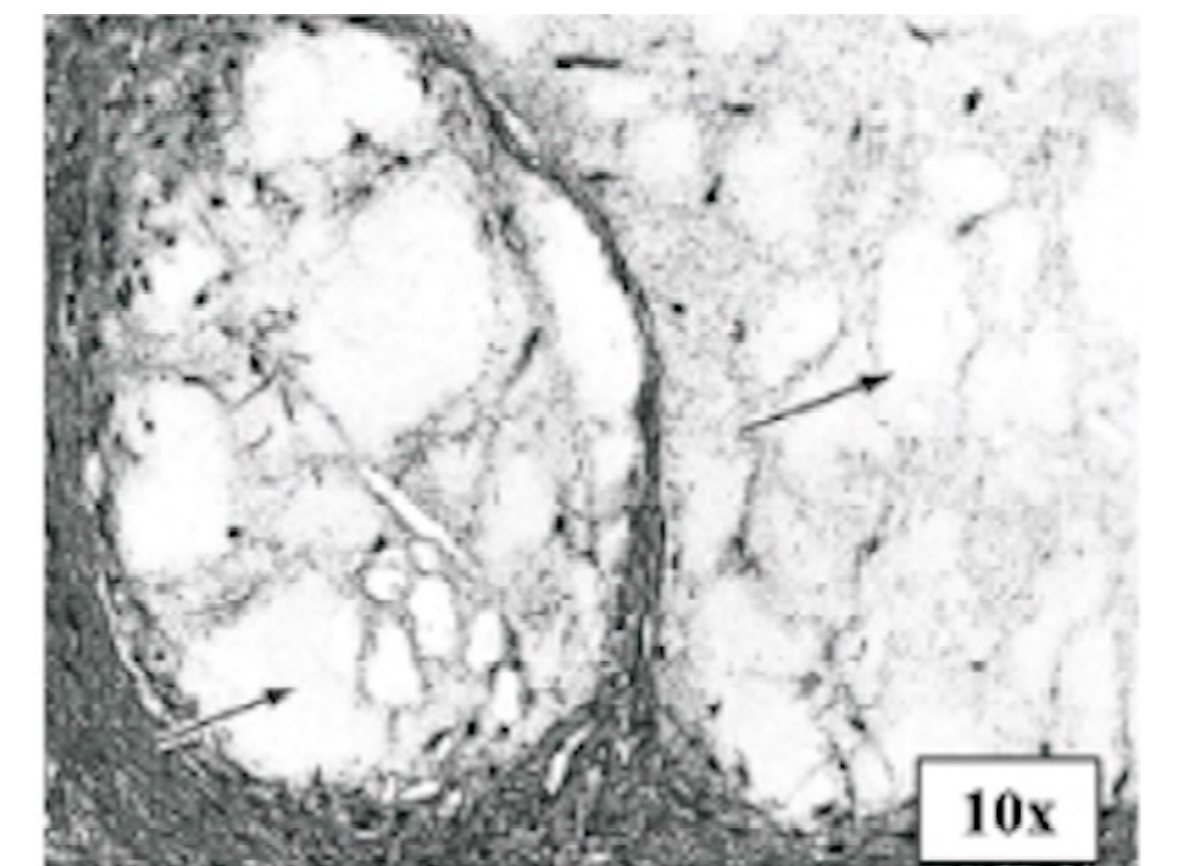
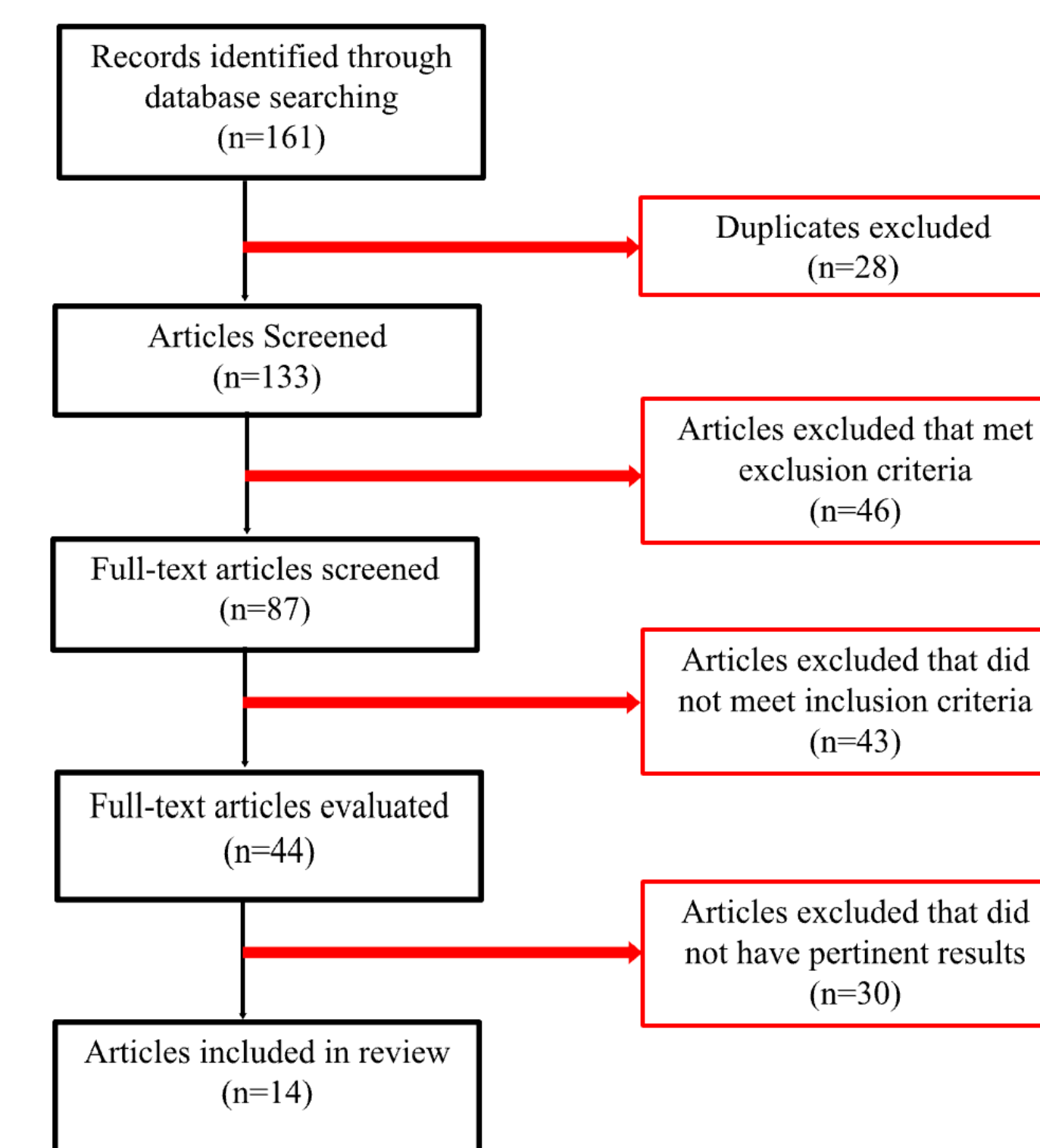


Figure 4: Skin Biopsy

Balogh, K (1986) described circumscribed collections of acellular finely granular material in a round or oval shape after methylprednisolone injections to the skin in 12 patients.

CONCLUSIONS

- The existing literature on reactions following corticosteroid injections is limited, mainly focusing on dermatological pathology and describing histological changes as a "granulomatous-like reaction."
- A case series presented in this study reports the first documented instances of granulomatous-like reactions in the epidural space following ILPESI.
- Tissue samples collected post-ILPESI with histological changes (Figure 1) consistent to previous descriptions in dermatological biopsies after particulate corticosteroid injections (Figure 4). Both reactions showed the presence of acellular, amorphous granular material surrounded by cellular reactions and fibrotic tissue. The findings were not consistent with overt inflammatory etiology.
- The consistency of histologic changes in both the epidural space post-ILPESI and those described in previous dermatologic literature post steroid injections, suggests a possible common mechanism of tissue reaction.
- These findings may have implications for the clinical use of particulate corticosteroid injections, particularly in the context of ILESi.