Research & Reviews: Journal of Clinical and Medical Case Studies

A Proposed Multimodal Therapy Approach for the Treatment of Arachnoiditis

Yeng F Her*

Department of Anesthesiology and Perioperative Medicine, Mayo Clinic Hospital, Rochester, USA

Commentary

Received: 21-May-2024, Manuscript No.JCMCS-24-136621; **Editor assigned:** 23-May-2024, PreQC No. JCMCS-24-136621(PQ); **Reviewed:** 07-June-2024, QCNo.JCMCS-24-136621; **Revised:** 13-June-2024, ManuscriptNo.JCMCS-24-136621(R); **Published:** 20-June-2024, DOI: 10.4172/J Clin Med Case Stud.9.2.001.

***For Correspondence:** Yeng F Her, Department of Anesthesiology and Perioperative Medicine, Mayo Clinic Hospital, Rochester, USA

E-mail: her.yeng@mayo.edu

Citation: Her YF. A Proposed Multimodal Therapy Approach for the Treatment of Arachnoiditis. J Clin Med Case Stud. 2024;9:001

DESCRIPTION

The goals of treatment of arachnoiditis are to control inflammation and prevent the formation of epidural fibrosis and to relieve pain. Understanding the mechanism of wound healing may facilitate the formulation of effective therapies for arachnoiditis. After a spine operation, hemostasis begins with formation of platelet plug and fibrin matrix to prevent blood loss followed by inflammation with neutrophils and macrophages infiltrate to remove debris and prevent infection [1,2]. The inflammation then recedes to allow angiogenesis, closure of the wound gap, and replace fibrin clot with granulation tissue. Finally, tissue remodeling leads to wound contraction and epidural fibrosis.

Although inflammation is critical to healing, excessive or uncontrolled neuroinflammation can result in unwanted epidural adhesion that increases nerve tension with movement, inhibits nerve function, and causes nerve injury. It has been shown that sustained increase neuroinflammation can lead to synaptic plasticity and increased neuronal sensitivity in the pain pathway resulting in a chronic hyperalgesic/allodynic state and promote widespread pain affecting multiple sites throughout the body [3]. Pharmacotherapies aiming to regulate neuroinflammation have been studied [4]. In this commentary, we propose possible pharmacotherapies to regulate neuroinflammation and to treat pain in acute and subacute arachnoiditis.

Given the complexity of neuroinflammation, a multimodal therapy approach for the treatment of arachnoiditis is proposed. In agreement with the case series, corticosteroid should be considered as a top tier treatment [5]. There have been multiple studies that demonstrate its effectiveness in preventing epidural fibrosis and alleviating pain [6-9]. Takeda et al. demonstrated that corticosteroids inhibit prostaglandin and cytokine productions, which are required for glia cell activation [6].

In a spinal nerve ligation model, methylprednisolone prevented and alleviated neuropathic pain. Dexamethasone reduced epidural adhesion *via* inhibition of vascular endothelial growth factor and vascular endothelial growth factor

receptor 2 expressions [7]. Similarly, methylprednisolone prevented formation of epidural fibrosis after spinal surgery [8]. In a systematic review and meta-analysis study, intraoperative or perioperative administration of epidural steroid provided significant pain control, reduced hospital stay time, and used of postoperative opioid analgesia[9]. Another potential top tier treatment to consider for arachnoiditis are Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as celecoxib [10], diclofenac sodium [11], ibuprofen [12], aceclofenac [13], and meloxicam [14]. These agents inhibit cyclooxygenases/prostaglandin E2 and lipoxygenases, which are critical for pro-inflammatory processes. It is readily available over the counter or *via* a prescription. In animal models, these agents have been shown to reduce epidural fibrosis. However, its use may be limited by the side effect profiles such as gastroenteritis, renal injury, and bleeding. Curcumin is a supplement that may be considered alongside with corticosteroids and NSAIDs. It has a different mechanism of action compared to corticosteroids and NSAIDs. It is an anti-inflammatory agent that inhibits nuclear factor kappa β, which is one of the central pathways in pro-inflammatory cytokine production, anti-apoptotic process, and cell survival [15]. In a laminectomy animal model, curcumin treated animals showed significant reduction of epidural fibrosis formation compared to the control group [16].

To alleviate pain, first line neuropathic pain medications such as Tricyclic Antidepressants (TCAs), Serotonin Norepinephrine Reuptake Inhibitors (SNRIs), and gabapentinoids should be considered [17]. Based on mechanism of action, onset, and side effect profiles, gabapentinoids are preferred. Lastly, physical therapy, massage, stretching, psychotherapy, and adaptive equipment may be needed to improve quality of life and manage symptoms.

CONCLUSION

In summary, multi-modal therapy approaches are needed to prevent epidural fibrosis by modulating inflammation and to treat pain in arachnoiditis. Inflammation may be regulated by corticosteroids, NSAIDS, and/or curcumin. Neuropathic pain may be treated with corticosteroids, NSAIDs, curcumin, TCAs, SNRIs, and/or gabapentinoids. Physical therapy and adaptive equipment can improve quality of life and manage symptoms. Physical, emotional, social, and occupational health may be improved with psychotherapy [18].

REFERENCES

1. Lewik G, et al. Postoperative epidural fibrosis: Challenges and opportunities - A review. Spine Surg Relat Res. 2024;2:133-142.
2. Jin Z, et al. Neutrophil extracellular traps promote scar formation in post-epidural fibrosis. NPJ Regen Med. 2020;1:19.
3. Ji R.R, et al. Neuroinflammation and central sensitization in chronic and widespread pain. Anesthesiology, 2018. 129(2): p. 343-366.
4. Ganesh V, et al. Pharmacotherapies to prevent epidural fibrosis after laminectomy: A systematic review of *in vitro* and *in vivo* animal models. Spine J. 2024;10:1471-1484.
5. Her YF, et al. Corticosteroid therapy in acute and subacute arachnoiditis - a case series. Int Med Case Rep J. 2024;235-240.
6. Takeda K, et al. Effect of methylprednisolone on neuropathic pain and spinal glial activation in rats. Anesthesiology. 2004;5:1249-1257.
7. Tian F, et al. Preventive effect of dexamethasone gelatin sponge on the lumbosacral epidural adhesion. Int J Clin Exp Med. 2015;4:5478-5484.
8. Yildirim T, et al. Comparison of curcumin and methylprednisolone in preventing epidural fibrosis after spinal surgery: An experimental study. J Exp Clin Med. 2021;2:88-93.

9. Wilson-Smith A, et al. Epidural steroids at closure after microdiscectomy/laminectomy for reduction of postoperative analgesia: Systematic review and meta-Analysis. World Neurosurg. 2018;e212-e221.
10. Wang W, et al. Celecoxib-loaded electrospun fibrous antiadhesion membranes reduce COX-2/PGE(2) induced inflammation and epidural fibrosis in a rat failed back surgery syndrome model. Neural Plast. 2021;6684176.
11. Erdogan B, et al. Preventative effect of diclofenac sodium and/or diltiazem in rats with epidural fibrosis. Bratisl Lek Listy. 2019;11:813-818.
12. Liu S, et al. Electrospun fibrous membranes featuring sustained release of ibuprofen reduce adhesion and improve neurological function following lumbar laminectomy. J Control Release. 2017;1-13.
13. Sandoval MA et al. Preventing peridural fibrosis with nonsteroidal anti-inflammatory drugs. Eur Spine J. 2008;3:451-455.
14. Shi R, et al. Effective delivery of mitomycin-C and meloxicam by double-layer electrospun membranes for the prevention of epidural adhesions. J Biomed Mater Res B Appl Biomater. 2020;2:353-366.
15. Paultre K, et al. Therapeutic effects of turmeric or curcumin extract on pain and function for individuals with knee osteoarthritis: A systematic review. BMJ Open Sport Exerc Med. 2021;1:e000935.
16. Ismailoglu O, et al. Effect of curcumin on the formation of epidural fibrosis in an experimental laminectomy model in rats. Turk Neurosurg. 2019;3:440-444.
17. Bates D, et al. A comprehensive algorithm for management of neuropathic pain. Pain Med. 2019;1:S2-S12.
18. Sturgeon JA. Psychological therapies for the management of chronic pain. Psychol Res Behav Manag. 2014;7:115-124.