Surgical Management and Adjunctive Therapy for Patients with Neurological Deficits from Vertebral Hemangiomas: a Meta-analysis and Systematic Review

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CNS 2017 ANNUAL MEETING
BOSTON, MASSACHUSETTS
OCTOBER 7–11, 2017

Background

Vertebral hemangioma (VH) is the most common benign spine tumor but rarely causes symptoms. There has yet to be an extensive analysis of the reported surgical cases, intervention modalities, & outcomes. Patients with back pain alone are often treated with conservative management (kyphoplasty & radiation therapy), while those with neurological deficits require complex multi-modal treatment plans. This study is an analysis on the surgical management & adjunctive therapies for patients presenting with neurological deficits from VH.

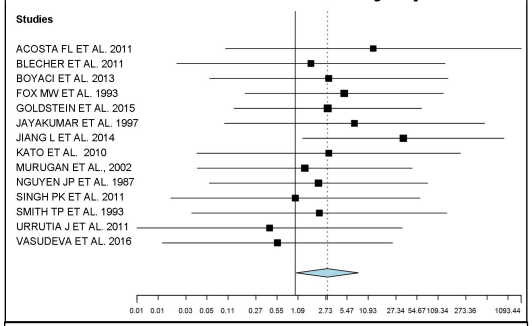
Methods

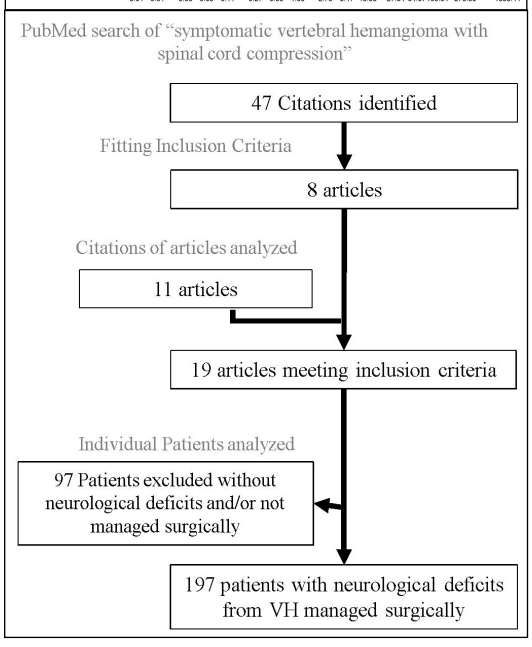
A PubMed literature search for "symptomatic vertebral hemangioma with spinal cord compression" identified 47 articles, see Figure below. Meta-analyses were preformed comparing outcomes of the surgical & adjunctive therapies using SPSS 24.0 software. For those with insufficient data for meta-analyses, descriptive analyses of variables were completed.

Surgical Management of Patients with Type IV Vertebral Hemangiomas

	NO. OF PTS	OPERATION	ADJUVANT THERAPY
ACOSTA FL ET AL. 2008	12	Laminectomy - 4. Vertebectomy - 9.	Postop XRT - 1.
ACOSTA FL ET AL. 2011	6	Thoracotomy - 4. Trapdoor approach - 1. Transpedicular corpectomy - 1. Fusion - 6	Preoperative embolization -6.
BLECHER ET AL. 2011	3	Laminectomy - 3.	Embolization - 3. Vertebroplasty - 3.
BOYACI ET AL. 2013	3	Laminectomy - 1. Corpectomy - 2.	XRT - 2. Embolization - 1.
FOX MW ET AL. 1993	11	Laminectomy - 8. Vertebrectomy - 1. Corpectomy - 2.	Embolization - 2. XRT - 5.
GOLDSTEIN ET AL. 2015	65	Intralesional rstn - 35. En bloc wide/marginal rstn - 7. Posterior fusion - 46. Anterior fusion - 18.	Preoperative embolization - 23. XRT - 6.
HEALY M ET AL. 1983	3	Pst Decompression - 3.	XRT only after recurrence - 1.
JANKOWSKI R ET AL. 2011	7	Ant decompression (vertebectomy) - 2. Pst decompression - 2. Posterolateral decompression - 3.	XRT - 3.
JAYAKUMAR ET AL. 1997	11	Decompressive laminectomy - 11	XRT - 11. Particulate embolization - 11.
JIANG L ET AL. 2014	21	Decompression - 18. Spondylectomy - 3.	XRT - 15. Biopsy - 7. Embolization - 19. Vertebroplasty - 8.
KATO ET AL. 2010	5	Total en bloc spondylectomy - 2. En bloc and piecemeal total excision - 2. Piecemeal total resection - 1.	Preoperative embolization - 5.
MCALLISTER V ET AL. 1975	5	Laminectomy - 5	XRT - 3.
MURUGAN ET AL. 2002	8	Laminectomy - 7. Anterior decompression (thoracotomy with embolization) - 1	EtOH injection - 1. XRT - 1. Embolization - 1.
NGUYEN JP ET AL. 1987	6	Laminectomy - 4. "Excision of tumor on pedicle"- 1. "Excision of vertebral body w/ XRT & biopsy"- 1.	Preoperative embolization- 2. XRT- 2. Biopsy - 1.
SINGH PK ET AL. 2011	10	Laminectomy w/ fusion – 10.	Preoperative embolization - 10.
SMITH TP ET AL. 1993	7	Laminectomy alone - 4. Debulking & fixation - 1. Laminectomy & vertebectomy - 1. Laminectomy, 2 embolizations, then debulking with graft - 1.	Preoperative embolization - 7.
URRUTIA J ET AL. 2011	4	Laminectomy - 3. Corpectomy - 1.	Embolization - 4. Vertebroplasty - 1. XRT - 1
VASUDEVA ET AL. 2016	4	Pst Decompression (total - 2, subtotal - 1) - 3. Fusion - 3. En bloc spondylectomy - 1.	XRT - 1. Biopsy -2. Embolization - 3. Vertebroplasty - 2.
ZHANG HL ET AL. 2012	6	Laminectomy - 6	Vertebroplasty - 6
	197	*LE = Lower Extremity. BP = Back Pain. XRT = Radiotherapy. Pst = Posterior. Ant = Anterior. Pt = patient.	

Forest plot of adjunctive embolization association with relief of symptoms





Results

197 surgical cases of VH with neurologic deficits were identified. The interventions identified included surgery (laminectomy & corpectomy, most commonly), radiation, embolization, & kyphoplasty. Surgery provided complete remission of symptoms in 84% of patients, however 18% of patients had recurrence. Of those with tumor recurrence or residual symptoms, those who had subsequent radiation had full remission of symptoms. Adjuvant radiation therapy was associated with a lower incidence of recurrence & a slight increase in minor transient adverse effects. Preoperative embolization was associated with improved symptoms (OR: 2.859, 95% CI: 1.027-7.960, p-value <0.05. Heterogeneity: t2=0.0, ?2=4.816, P=0.979, I2=0%), in addition to having higher incidences of reduced complications, recurrence rate, & blood loss. Of the 97 patients who underwent embolization, 6 experienced pathologic vertebral fractures compared to 0 in the patients not recieving embolization.

Conclusions

For patients with neurologic deficits from VH, surgery provides improvement in symptoms. Recurrence of VH & symptoms refractive to surgery can be further reduced by adjunctive therapies such as embolization, kyphoplasty, and radiation. Embolization is particularily useful but may risks of vertebral fracture deserves consideration.