

Figure 1: Example of weight-bearing Flexion + Extension X-Ray of a Hypermobile patient.

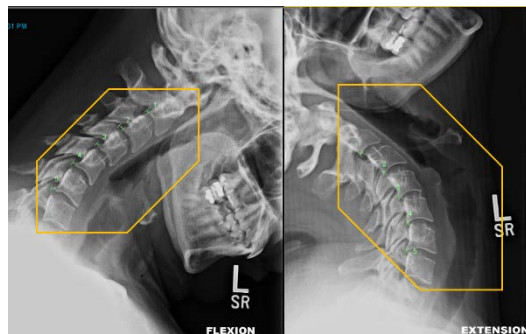
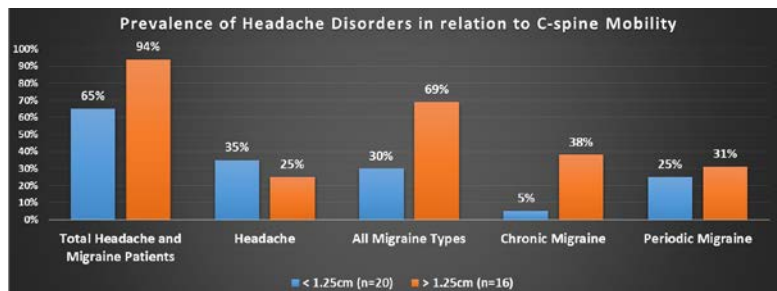


Figure 2: Graph and table expressing headache and migraine prevalence in hypermobile patients with total cervical spine mobility less (n=20) or greater (n=16) than 1.25cm.



Total C-Spine Mobility	Total Headache and Migraine Patients	Headache	All Migraine Types	Chronic Migraine	Periodic Migraine
< 1.25cm (n=20)	13 (65%)	7 (35%)	6 (30%)	1 (5%)	5 (25%)
> 1.25cm (n=16)	15 (94%)	4 (25%)	11 (69%)	6 (38%)	5 (31%)

Figure 3: Table of the Prevalence of SDB, Headache or Migraine, DCS, and DYS in all Hypermobile patients.

	Female		Male		Total	
N	42	85.70%	7	14.30%	49	100.00%
Age	34 (±.09)		28.71 (± 6.46)		33 (± 2.00)	
BMI	27.11 (± 1.22)		22.93 (± 1.30)		27 (± 1.08)	
		% of F		% of M		% of Total
Headache or Migraine	34	81.00%	2	28.60%	36	73.50%
Disorder of Cervical Spine	40	95.20%	4	57.10%	44	89.80%
Symptom(s) of Dysautonomia	36	75.70%	5	71.40%	41	83.70%
Fatigue or Sleep Complaints	36	85.70%	5	71.40%	41	83.70%
SDB	28	66.70%	3	42.90%	31	63.30%

Figure 4: Pie chart of the number of disorders present in each hypermobile patient. Only SDB, DYS, Headache or Migraine, and DCS were considered.

Number of Disorders Possessed by Hypermobile Patients

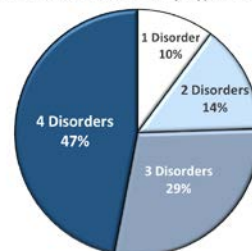
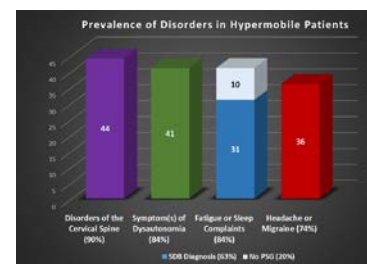


Figure 5: Bar Graph of the prevalence of commonly found disorders in 49 hypermobile patients.



Discussion:

The presence of headache and migraine in JHS has been noted previously,¹ and the probable reasons for this association have been suggested.² Similarly, a significant majority of patients in this series had some type of headache disorder.

Although Dysautonomia and Disorders of the Cervical Spine have been known to contribute to Headache symptoms, as well as to be prevalent in hypermobile patients,² a new finding from this study is the relatively high prevalence of SDB in JHS patients.

Since our cohort of patients with JHS had a high prevalence of SDB and headache, SDB itself may be a major contributor to headache severity and frequency in JHS patients through the following mechanism: JHS patients with SDB attempt to optimize airway patency during sleep with cervical hyper-extension. The degree of cumulative cervical vertebral body translocation on flexion and extension appears to be an important predictor of migraine frequency and severity in patients with JHS. Since the Vertebral Arteries traverse the lateral masses of these vertebral bodies, they could be stimulated in some way to initiate the migraine cascade.

In addition, the presence of Headache, JHS, DYS, DCS, and SDB frequently occur together. Whether this group of symptoms have a common cause, either genetic, epigenetic, or environmental, must await further research.

Conclusions:

1. Headache, DYS, DCS, and SDB frequently occur together in patients with JHS.
2. Each of these disorders individually must be addressed to improve patients' quality of life.
3. The initiation of the migraine cascade could occur with cervical extension during sleep in patients with JHS and SDB.
4. The cumulative cervical spine translocation (CCST) can possibly predict headache frequency and severity.
5. Whether or not SDB, JHS, DYS, and Headache share a common cause must await further research.

References:

1. Puledda, Francesca, et al. "A Study of Migraine Characteristics in Joint Hypermobility Syndrome A.k.a. Ehlers-Danlos Syndrome, Hypermobility Type." *Neurological Sciences* 36.8 (2015): 1417-424. Web.
2. Martin, Vincent T., and Derek Neilson. "Joint Hypermobility and Headache: The Glue That Binds the Two Together - Part 2." *Headache: The Journal of Head and Face Pain* 54.8 (2014): 1403-411. Web.

Introduction:

Joint Hypermobility Syndrome (JHS) seems to have an unusually high prevalence in patients who come to our headache center. Most of these patients also have additional symptoms of Dysautonomia (DYS), Sleep Disorders (usually Sleep Disordered Breathing (SDB)), and Disorders of the Cervical Spine (DCS). Therefore, it seemed appropriate to study the relationship between JHS, Headache, Sleep Disorder, and DYS.

Methods:

Charts of 49 consecutive patients with a Beighton hypermobility score ≥ 5 were retrospectively reviewed. The presence of Fatigue or Sleep Complaints, Sleep Disordered Breathing, Headache or Migraine, Disorders of the Cervical Spine, and Symptoms of Dysautonomia was evaluated.

The movement of vertebral bodies C3-C7 on weight-bearing flexion and extension X-Rays of the cervical spine for 36 patients was measured to quantify cervical spine mobility for each patient. In addition, polysomnograms (PSG) were obtained, when appropriate, to evaluate sleep complaints.

Results:

1. In this series, 41% of patients with JHS had a chief complaint of some type of headache.
2. Seventy-three percent (73%) of all patients in this series, when questioned, ultimately had major complaints related to headache or migraine.
3. See figures 3-6 for prevalence of SDB, Headache or Migraine, Disorders of the Cervical Spine, and Symptoms of Dysautonomia.
4. Sixty-one percent (61%) of headache and migraine patients had symptoms related to DCS, SDB, and DYS.
5. In this series of JHS patients, those with cervical spine mobility of greater than 1.25cm (n=16) had migraine with a prevalence more than two times, and chronic migraine more than 7 times that of those patients with a cumulative cervical spine mobility less than 1.25cm (n=20). See figure 2.

Figure 6: Table of the Prevalence of SDB, DCS, DYS, and subtypes of Headache disorders, in all Hypermobile patients with Headache or Migraine.

	Female		Male		Total	
N	34	94.44%	2	5.56%	36	100.00%
Age	33.85 ± 2.04		15 ± 3.00		32.8 ± 2.06	
BMI	27.64 ± 1.37		20.75 ± 1.35		27.25 ± 1.32	
		% of F		% of M		% of Total
Disorder of Cervical Spine	34	100.00%	2	100.00%	36	100.00%
Symptom(s) of Dysautonomia	30	88.24%	2	100.00%	32	88.89%
Fatigue or Sleep Complaints	29	85.29%	1	50.00%	30	83.33%
SDB	24	70.59%	1	50.00%	25	69.44%
Headache or Migraine:	34	100.00%	2	100.00%	36	100.00%
Chronic Headache/Migraine	10	29.41%	0		10	27.78%
Headache	12	35.29%	1	50.00%	13	36.11%
Migraine with Aura	3	8.82%	0		3	8.33%
Migraine without Aura	4	11.77%	1	50.00%	5	13.89%
Other Migraine Disorder	5	14.71%	0		5	13.89%