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Left and Non-Dominant Shoulders Were More Frequently Affected in Patients with Frozen Shoulder: A Systematic Review and Meta-Analysis

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Abstract

Background: If trauma has a considerable impact on frozen shoulder, the right or dominant shoulder is more frequently affected than the left or non-dominant shoulder. Herein it is examined whether the right or dominant shoulder was more frequently affected in patients with frozen shoulder using PubMed.

Materials and methods: PubMed was searched to retrieve relevant studies. The search term used was frozen shoulder. The studies obtained were published between 1966 and 2007, and included 10 or more patients with only one affected side. Patients with bilateral shoulder involvement were excluded.

Results: The right shoulder was affected in 718 patients (46.3%), while the left shoulder was affected in 833 (53.7%). The dominant shoulder was affected in 298 patients (41.1%), while the non-dominant shoulder was affected in 427 (58.9%). The left shoulder was affected significantly more than the right shoulder ($p<0.01$). The non-dominant shoulder was affected significantly more than the dominant shoulder ($p<0.01$).

Conclusion: Trauma including repeated minor trauma is less likely to cause frozen shoulder, or the influence of brain abnormalities is stronger than that of trauma. The left shoulder may have been more frequently affected because of the side-to-side asymmetry of the brain for various reasons. If this hypothesis is correct, brain abnormalities may be one cause of frozen shoulder, suggesting that central neuropathic pain or braingenic pain contributes to the pain associated with frozen shoulder. The right and dominant shoulders were less frequently affected in patients with frozen shoulder.

Keywords: Frozen shoulder; Side-to-side asymmetry; Dominant hand; Right; Left; Frequency

Introduction

Trauma including repeated minor trauma may cause frozen shoulder [1]. If trauma has a considerable impact on frozen shoulder, the right or dominant shoulder is more frequently affected than the left or non-dominant shoulder. Herein it is examined whether the right or dominant shoulder was more frequently affected using PubMed.

Materials and Methods

PubMed was searched to retrieve relevant studies. The search term used was "frozen shoulder." The following inclusion criteria were employed; (1) Studies published between 1966 and 2007; (2) Studies written in English; (3) Studies including 10 or more patients with only one affected side. Patients with bilateral shoulder involvement were excluded; (4) Studies comprising full reports (no letters or abstracts); (5) If one group published 2 or more studies, only one study with the largest number of patients was used; (6) The study by Weiser [2] reported the following: the left and right side were equally involved (n=100). The study by Bunker et al. [3] demonstrated that "The left and right shoulders were equally involved (n=50). Therefore, the right side is considered to be involved in 50% of patients in these studies [2,3] (Figure 1). The goodness-of-fit test was applied. A P value<0.01 was considered to be significant.

Results

The right shoulder was affected in 718 patients (46.3%), while the left shoulder was affected in 833 (53.7%). The dominant shoulder was affected in 298 patients (41.1%), while the non-dominant shoulder was affected in 427 (58.9%). The left shoulder was affected significantly more than the right shoulder ($p<0.01$). The non-dominant shoulder was affected significantly more than the dominant shoulder ($p<0.01$) (Table 1).

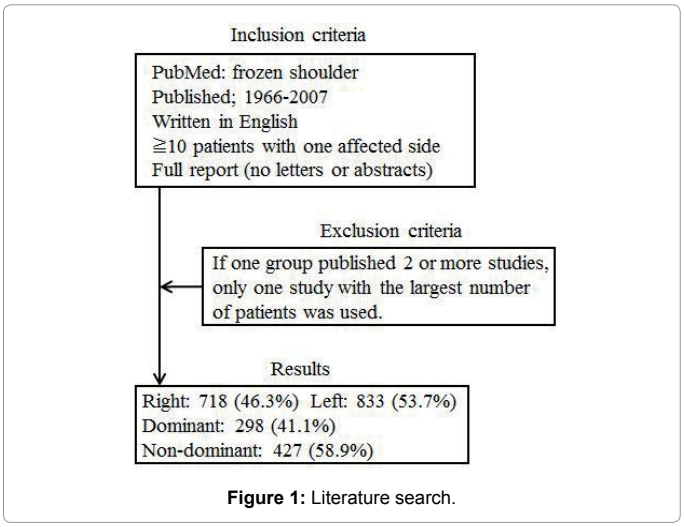

Figure 1: Literature search.

Discussion

The cause of frozen shoulder currently remains unknown. A systematic review showed that the pathophysiology associated with

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Year	Author	Right	Left	Sum	Dominant	Non-dominant	Sum	Number of articles
1969	Lundberg	90	142	232				8
1975	Reeves	23	17	40				9
1977	Weiser	50	50	100				2
1983	Helbig	70	44	114				10
1984	Bulgen				22	19	41	11
1989	Parker	13	11	24	15	9	24	12
1991	Hsu	20	55	75				13
1993	Uitvlugt	7	12	19	7	12	19	14
1995	Bunker	25	25	50				3
1995	Weber	16	22	38	13	20	33	15
1995	Melzer	56	52	108				16
1998	Gam	49	45	94				17
1998	Leppala				18	35	53	18
1999	Reichmister	10	16	26	10	16	26	19
1999	O'Kane	12	24	36				20
1999	Okamura	21	9	30				21
2000	Watson	36	31	67				22
2000	Dodenhoff	16	19	35	24	11	35	23
2001	Carter	11	9	20	9	11	20	24
2001	Omari	13	12	25				25
2002	Klinger	19	17	36				26
2002	Vermeulen	7	3	10				27
2002	Massoud	18	21	39	18	21	39	28
2002	Halverson	11	10	21				29
2002	Othman				22	32	54	30
2003	Hamdan	29	61	90	24	66	90	31
2003	Rundquist	4	6	10				32
2004	Buchbinder	23	26	49				33
2004	Widiastuti-Samekto	11	16	27				34
2005	Khan	23	12	35				35
2006	Ma				33	42	75	36
2006	Ryu	4	6	10				37
2007	Kivimaki	42	83	125	41	84	125	38
2007	Amir-Us-Saqlain	9	24	33	9	24	33	39
2007	Baums	18	12	30	18	12	30	40
2007	Sakeni	52	83	135				41
2007	Yang				15	13	28	42
	Total	718	833	1551	298	427	725	

Table 1: Results of shoulder affected patients.

primary (idiopathic) frozen shoulder was inconclusive [4]. Trauma including repeated minor trauma may cause frozen shoulder [1]. If this hypothesis is correct, the right or dominant shoulder is more frequently affected. However, in contrast to predictions, the left and non-dominant shoulders were more frequently affected. Trauma including repeated minor trauma may be less likely to cause frozen shoulder, while the influence of brain abnormalities appears to be stronger than that of trauma.

It currently remains unclear why the left and non-dominant shoulders are more frequently affected. Based on previous findings, Merskey et al. reported that pain was more often lateralized on the left, except in the case of trigeminal neuralgia [5]. Previous experimental evidence implied that the right hemisphere was less efficient than the left in processing cutaneous sensory input [5]. Ertunc et al. reported that the herpes zoster infection frequency was higher in right-handed patients and more frequently appeared in the left body side of females [6]. Dane et al. showed that the cell-mediated hypersensitivity was stronger in the left side of the body than the right based on the tuberculin test with 22 male and 36 female healthy high school students [7]. The left shoulder may have been more frequently affected by frozen shoulder because of the side-to-side asymmetry of the brain for various reasons. If this hypothesis is correct, brain abnormalities are one of the causes of frozen shoulder, suggesting that central neuropathic pain or braingenic pain contributes to the pain associated with frozen shoulder.

The non-dominant shoulder (58.9%) was more frequently affected than the left shoulder (53.7%). The reason for this remains unknown. It may be due to the roles of the right brain in right-handedness and those of the left brain in left-handedness not necessarily being the same, as well as the roles of the right brain in left-handedness and those of the left brain in right-handedness not necessarily being the same [2,3,8-42].

Limitations

Some physicians may believe that trauma including repeated minor trauma causes frozen shoulder. These physicians may be more likely to think that the right or dominant shoulder is more frequently affected than the left or non-dominant shoulder. Therefore, in case that the left or non-dominant shoulder is more frequently affected than the right or

dominant shoulder, it is possible that they are more likely to interested in it and report it. These may cause a bias.

Conclusion

The right shoulder was affected in 718 patients (46.3%), while the left shoulder was affected in 833 (53.7%). The dominant shoulder was affected in 298 patients (41.1%), while the non-dominant shoulder was affected in 427 (58.9%). The left shoulder was affected significantly more than the right shoulder ($p<0.01$). The non-dominant shoulder was affected significantly more than the dominant shoulder ($p<0.01$).

Conflict of Interest

The author confirms that this article content has no conflict of interest.

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References

1. Harryman DT, 2nd (1993) Shoulders: Frozen and stiff. Instr Course Lect 42: 247-257.
2. Weiser HI (1977) Painful primary frozen shoulder mobilization under local anesthesia. Arch Phys Med Rehabil 58: 406-408.
3. Bunker TD, Anthony PP (1995) The pathology of frozen shoulder. A Dupuytren-like disease. J Bone Joint Surg Br 77: 677-683.
4. Ryan V, Brown H, Minns Lowe CJ, Lewis JS (2016) The pathophysiology associated with primary (idiopathic) frozen shoulder: A systematic review. BMC Musculoskelet Disord 17: 340.
5. Merskey H, Watson GD (1979) The lateralisation of pain. Pain 7: 271-280.
6. Ertunc V, Dane S, Karakuzu A, Deniz O (1997) Higher herpes zoster infection frequency in right-handed patients and more frequent appearance in the left body side of females. Acta Derm Venereol 77: 245.
7. Dane S, Erdem T, Gumustekin K (2001) Cell-mediated immune hypersensitivity is stronger in the left side of the body than the right in healthy young subjects. Percept Mot Skills 93: 329-332.
8. Lundberg BJ (1969) The frozen shoulder: Clinical and radiographical observations. The effect of manipulation under general anesthesia, structure and glycosaminoglycan content of the joint capsule, local bone metabolism. Acta Orthop Scand Suppl 119: 1-59.
9. Reeves B (1975) The natural history of the frozen shoulder syndrome. Scand J Rheumatol 4: 193-196.
10. Helbig B, Wagner P, Dohler R (1983) Mobilization of frozen shoulder under general anaesthesia. Acta Orthop Belg 49: 267-274.
11. Bulgen DY, Binder AI, Hazleman BL, Dutton J, Roberts S (1984) Frozen shoulder: Prospective clinical study with an evaluation of three treatment regimens. Ann Rheum Dis 43: 353-360.
12. Parker RD, Froimson AI, Winsberg DD, Arsham NZ (1989) Frozen shoulder. Part II: Treatment by manipulation under anesthesia. Orthopedics 12: 989-990.
13. Hsu SY, Chan KM (1991) Arthroscopic distension in the management of frozen shoulder. Int Orthop 15: 79-83.
14. Uitvlugt G, Detrisac DA, Johnson LL, Austin MD, Johnson C (1993) Arthroscopic observations before and after manipulation of frozen shoulder. Arthroscopy 9: 181-185.
15. Weber M, Prim J, Bugglin R, Michel BA, Gerber H (1995) Long-term follow up to patients with frozen shoulder after mobilization under anesthesia, with special reference to the rotator cuff. Clin Rheumatol 14: 686-691.
16. Melzer C, Wallny T, Wirth CJ, Hoffman S (1995) Frozen shoulders- treatment and results. Arch Orthop Trauma Surg 114: 87-91.
17. Gam AN, Schydlowsky P, Rossel I, Remvig L, Jensen EM (1998) Treatment of "frozen shoulder" with distension and glucorticoid compared with glucorticoid alone. A randomised controlled trial. Scand J Rheumatol 27: 425-430.
18. Leppala J, Kannus P, Sievanen H, Jarvinen M, Vuori I (1998) Adhesive capsulitis of the shoulder (frozen shoulder) produces bone loss in the affected humerus, but long-term bony recovery is good. Bone 22: 691-694.
19. Reichmister JP, Friedman SL (1999) Long-term functional results after manipulation of the frozen shoulder. Md Med J 48: 7-11.
20. O'Kane JW, Jackins S, Sidles JA, Smith KL, Matsen FA (1999) Simple home program for frozen shoulder to improve patients' assessment of shoulder function and health status. J Am Board Fam Pract 12: 270-277.
21. Okamura K,Ozaki J (1999) Bone mineral density of the shoulder joint in frozen shoulder. Arch Orthop Trauma Surg 119: 363-367.
22. Watson L, Dalziel R, Story I (2000) Frozen shoulder: A 12-month clinical outcome trial. J Shoulder Elbow Surg 9: 16-22.
23. Dodenhoff RM, Levy O, Wilson A, Copeland SA (2000) Manipulation under anesthesia for primary frozen shoulder: effect on early recovery and return to activity. J Shoulder Elbow Surg 9: 23-26.
24. Carter B (2001) A pilot study to evaluate the effectiveness of Bowen technique in the management of clients with frozen shoulder. Complement Ther Med 9: 208-215.
25. Omari A, Bunker TD (2001) Open surgical release for frozen shoulder: Surgical findings and results of the release. J Shoulder Elbow Surg 10: 353-357.
26. Klinger HM, Otte S, Baums MH, Haerer T (2002) Early arthroscopic release in refractory shoulder stiffness. Arch Orthop Trauma Surg 122: 200-203.
27. Vermeulen HM, Stokdijk M, Eilers PH, Meskers CG, Rozing PM, et al. (2002) Measurement of three dimensional shoulder movement patterns with an electromagnetic tracking device in patients with a frozen shoulder. Ann Rheum Dis 61: 115-120.
28. Massoud SN, Pearse EO, Levy O, Copeland SA (2002) Operative management of the frozen shoulder in patients with diabetes. J Shoulder Elbow Surg 11: 609-613.
29. Halverson L,Maas R (2002) Shoulder joint capsule distension (hydroplasty): A case series of patients with "frozen shoulders" treated in a primary care office. J Fam Pract 51: 61-63.
30. Othman A,Taylor G (2002) Manipulation under anaesthesia for frozen shoulder. Int Orthop 26: 268-270.
31. Hamdan TA, Al-Essa KA (2003) Manipulation under anaesthesia for the treatment of frozen shoulder. Int Orthop 27: 107-109.
32. Rundquist PJ, Anderson DD, Guanche CA, Ludewig PM (2003) Shoulder kinematics in subjects with frozen shoulder. Arch Phys Med Rehabil 84: 1473-1479.
33. Buchbinder R, Hoving JL, Green S, Hall S, Forbes A, et al. (2004) Short course prednisolone for adhesive capsulitis (frozen shoulder or stiff painful shoulder): A randomised, double blind, placebo controlled trial. Ann Rheum Dis 63: 1460-1469.
34. Widiastuti-Samekto M, Sianturi GP (2004) Frozen shoulder syndrome: Comparison of oral route corticosteroid and intra-articular corticosteroid injection. Med J Malaysia 59: 312-316.
35. Khan AA, Mowla A, Shakoor MA, Rahman MR (2005) Arthrographic distension of the shoulder joint in the management of frozen shoulder. Mymensingh Med J 14: 67-70.
36. Ma T, Kao MJ, Lin IH, Chiu YL, Chien C, et al. (2006) A study on the clinical effects of physical therapy and acupuncture to treat spontaneous frozen shoulder. Am J Chin Med 34: 759-775.
37. Ryu JD, Kirpalani PA, Kim JM, Nam KH, Han CW, et al. (2006) Expression of vascular endothelial growth factor and angiogenesis in the diabetic frozen shoulder. J Shoulder Elbow Surg 15: 679-685.
38. Kivimaki J, Pohjolainen T, Malmivaara A, Kannisto M, Guillaume J, et al. (2007) Manipulation under anesthesia with home exercises versus home exercises alone in the treatment of frozen shoulder: A randomized, controlled trial with 125 patients. J Shoulder Elbow Surg 16: 722-726.
39. Amir-Us-Saqlain H, Zubairi A, Taufiq I (2007) Functional outcome of frozen shoulder after manipulation under anaesthesia. J Pak Med Assoc 57: 181-185.
40. Baums MH, Spahn G, Nozaki M, Steckel H, Schultz W, et al. (2007) Functional outcome and general health status in patients after arthroscopic release in adhesive capsulitis. Knee Surg Sports Traumatol Arthrosc 15: 638-644.
41. Sakeni RA, Al-Nimer MS (2007) Comparison between intra-articular triamcinolone acetonide and methylprednisolone acetate injections in treatment of frozen shoulder. Saudi Med J 28: 707-712.
42. Yang JL, Chang CW, Chen SY, Wang SF, Lin JJ (2007) Mobilization techniques in subjects with frozen shoulder syndrome: Randomized multiple-treatment trial. Phys Ther 87: 1307-1315.