The End of an Era?

JEREMY LEWIS, *PhD, FCSP*
Central London Community Healthcare National Health Service Trust, London, United Kingdom.
School of Health and Social Work, University of Hertfordshire, Hatfield, United Kingdom.

J Orthop Sports Phys Ther 2018;48(3):127-129. doi:10.2519/jospt.2018.0102

Nineteen seventy-two was a memorable year. The average price of a home was $27 600 in the United States and £7400 in the United Kingdom. It was the year of Bloody Sunday in Northern Ireland. It was the year the world watched in awe as Mark Spitz won 7 gold medals in the Olympics and was horrified by the terrorist atrocities at the same Olympics. It was the year the digital watch was introduced and the year the first handheld scientific calculator, the HP-35, became available and was on every scientist's wish list, costing a mere $395! It was the year *Dirty Harry* was playing in movie theatres and Roberta Flack's "The First Time Ever I Saw Your Face" was on everyone's lips. It was also the year that Don McLean's "American Pie" was the number 1 US hit for 4 weeks and the whole world was trying to decipher its meaning. That same year, President Nixon visited China and ended a quarter century of no diplomatic ties, and the famous American orthopaedic surgeon, Charles Neer, published his seminal paper, "Anterior Acromioplasty for the Chronic Impingement Syndrome in the Shoulder: A Preliminary Report."[27]

This wasn't a robust scientific paper. By today's terms, we might call it a blog. However, this "blog" changed the direction of orthopaedic practice for the next half century. Neer argued that a primary cause of shoulder pain was attrition of the supraspinatus tendon and related structures, such as the subacromial bursa, from the overlying acromion, especially when the arm was elevated, a position that is commonplace in throwing sports, swimming, the building industry, hair dressing, and myriad other human activities. In 1983, he wrote, "95% of tears of the rotator cuff are caused by impingement."[28] Neer recommended surgical removal to stop the impingement, and over the last half century, based on the available statistics,[11,32] it could be argued that millions of people around the globe would have undergone acromioplasty surgery to stop this portion of the bone impinging onto the soft tissues located in the subacromial space. Others followed,[2] implicating the shape of the acromion as a causative factor in the impingement process, with a type 3, downward-sloping or hooked acromion predisposing the individual to a higher risk of impingement and symptoms, due to increased narrowing and encroachment onto the subacromial space.[2]

However, against the tide of subacromial decompression surgery there has been dissent, and the relationship between the acromion and symptoms has been challenged. Henkus et al[9] reported that at 2.5-year follow-up, removal of the acromion and bursectomy were no more beneficial than a bursectomy alone, and in a recent 12-year follow-up, the same findings were reported.[13]

Narrative challenges to the subacromial impingement theory have been published,[17,19-23] arguing that the anatomy, pathology, poor relationship between imaging and symptoms, and equivalent outcomes obtained with other interventions, such as exercise, even in the presence of a type 3 acromion, compellingly dispute the relevance of the acromion as initially hypothesized. Lewis[17,22] hypothesized that the reported benefits of acromioplasty may not be due to removal of the anteroinferior aspect of the acromion, but rather to the many weeks of "relative rest" and to the graduated and incremental rehabilitation following surgery.[5,24] Lewis[17,19,22] also hypothesized that the benefits of the surgery may be due to the potential benefits of a placebo effect. A substantial body of clinical research now suggests that the reported outcomes of many elective orthopaedic surgical procedures may be attributable to such a response.[8,10,26,29,30]

The findings of the recently published Can Shoulder Arthroscopy Work (CSAW) study[1] have substantially confirmed these earlier hypotheses. In this randomized 3-group trial, acromioplasty was reported to be no more beneficial than investigational arthroscopy and no intervention at 6-month and

Dr Jeremy Lewis lectures and teaches internationally on the assessment and management of musculoskeletal conditions involving the shoulder. He also has research interests and publications in the same clinical specialty.

1-year follow-ups. Although pressured saline would have been introduced into the shoulder in the investigational arthroscopy group, it was designated as a placebo, as no bone or soft tissue was removed. These findings substantially challenge the rationale behind the proposed biomechanical benefit of subacromial decompression surgery and may herald the end of the era for this procedure. At the very minimum, they should challenge surgeons, health funding bodies, insurance providers, clinicians, the media, and those contemplating surgery to reflect on the published literature.

The evidence unequivocally demonstrates that an exercise program is as effective as surgery for what has been termed *subacromial impingement syndrome* at 1-, 2-, 4-, 5-, and 10-year follow-ups,[7,12] and is as effective as surgery for partial-thickness rotator cuff tears.[15] There is also evidence that 75% of people experiencing symptoms attributed to an atraumatic full-thickness rotator cuff tear who undergo an exercise program will not require surgery.[14] There is also evidence that surgical outcomes for full-thickness rotator cuff tears are not related to the "success" of the surgery.[3,4] However, there is a fairly large "elephant in the room" here: if surgery can be a placebo, exercise could be a placebo as well, or both interventions may only be mapping the natural course of the condition as the patient's symptoms regress to the mean.[18] We need to better understand the effect of our nonsurgical interventions, and more research, much more, is needed. However, proponents of evidence-based practice would advocate that if there are 2 interventions of equal clinical effectiveness (even if the basis for that outcome is uncertain), then the choice of the economically competitive treatment should dominate that of the more expensive intervention, allowing the finite resources to be directed in a more appropriate manner. Furthermore, activity- and exercise-based interventions have significant and important health benefits.[16] Different exercise programs may have different outcomes,[31] and, although manual therapy may only have a short-term effect[31] and provide no difference in functional outcome measurements (Shoulder Pain and Disability Index [SPADI] and the shortened version of the Disabilities of the Arm, Shoulder and Hand questionnaire [QuickDASH]), its addition might improve patient-perceived success at 4 weeks and 6 months, and acceptability of symptoms at 4 weeks.[25]

Finally, what should we call this condition? Impingement is inappropriate; an aberrant acromion is not pushing down onto the underlying tissues. It is important to consider that an individual's decision to undergo surgery is most strongly predicted by the individual's low expectation that physical therapy could be of benefit[6]; therefore, framing the need for surgery around an unsubstantiated pathoanatomical model may add to this low expectation. A term that suggests that exercise as an intervention might be of benefit, without the need for surgery as a first-line treatment, may motivate the individual to participate in an active management strategy. This, together with the uncertainty pertaining to the acromial theory, was the main reason the term *rotator cuff–related shoulder pain* was suggested.[19] This body of research should compel all health practitioners to speak with one voice, using carefully constructed language that does not introduce yellow flags by implicating structures that do not appear to be the cause of the symptoms.

REFERENCES

1. Beard DJ, Rees JL, Cook JA, et al. Arthroscopic subacromial decompression for subacromial shoulder pain (CSAW): a multicentre, pragmatic, parallel group, placebo-controlled, three-group, randomised surgical trial. *Lancet*. 2018;391:329-338. https://doi.org/10.1016/S0140-6736(17)32457-1
2. Bigliani L, Morrison D, April E. The morphology of the acromion and its relationship to rotator cuff tears. *Orthop Trans*. 1986;10:216.
3. Carr A, Cooper C, Campbell MK, et al. Effectiveness of open and arthroscopic rotator cuff repair (UKUFF): a randomised controlled trial. *Bone Joint J*. 2017;99-B:107-115. https://doi.org/10.1302/0301-620X.99B1.BJJ-2016-0424.R1
4. Carr AJ, Cooper CD, Campbell MK, et al. Clinical effectiveness and cost-effectiveness of open and arthroscopic rotator cuff repair [the UK Rotator Cuff Surgery (UKUFF) randomised trial]. *Health Technol Assess*. 2015;19:1-218. https://doi.org/10.3310/hta19800
5. Charalambous CP, Sahu A, Alvi F, Batra S, Gullett TK, Ravenscroft M. Return to work and driving following arthroscopic subacromial decompression and acromio-clavicular joint excision. *Shoulder Elbow*. 2010;2:83-86. https://doi.org/10.1111/j.1758-5740.2010.00048.x
6. Dunn WR, Kuhn JE, Sanders R, et al. 2013 Neer Award: predictors of failure of nonoperative treatment of chronic, symptomatic, full-thickness rotator cuff tears. *J Shoulder Elbow Surg*. 2016;25:1303-1311. https://doi.org/10.1016/j.jse.2016.04.030
7. Haahr JP, Andersen JH. Exercises may be as efficient as subacromial decompression in patients with subacromial stage II impingement: 4-8-years' follow-up in a prospective, randomized study. *Scand J Rheumatol*. 2006;35:224-228. https://doi.org/10.1080/03009740600556167
8. Harris I. *Surgery, the Ultimate Placebo: A Surgeon Cuts Through the Evidence*. Coogee, Australia: NewSouth Publishing; 2016.
9. Henkus HE, de Witte PB, Nelissen RG, Brand R, van Arkel ER. Bursectomy compared with acromioplasty in the management of subacromial impingement syndrome: a prospective randomised study. *J Bone Joint Surg Br*. 2009;91:504-510. https://doi.org/10.1302/0301-620X.91B4.21442
10. Jonas WB, Crawford C, Colloca L, et al. To what extent are surgery and invasive procedures effective beyond a placebo response? A systematic review with meta-analysis of randomised, sham controlled trials. *BMJ Open*. 2015;5:e009655. https://doi.org/10.1136/bmjopen-2015-009655
11. Judge A, Murphy RJ, Maxwell R, Arden NK, Carr AJ. Temporal trends and geographical variation in the use of subacromial decompression and rotator cuff repair of the shoulder in England. *Bone Joint J*. 2014;96-B:70-74. https://doi.org/10.1302/0301-620X.96B1.32556
12. Ketola S, Lehtinen JT, Arnala I. Arthroscopic decompression not recommended in the treatment of rotator cuff tendinopathy: a final review of a randomised controlled trial at a minimum follow-up of ten years. *Bone Joint J*. 2017;99-B:799-805. https://doi.org/10.1302/0301-620X.99B6.BJJ-2016-0569.R1
13. Kolk A, Thomassen BJW, Hund H, et al. Does acromioplasty result in favorable clinical and radiologic outcomes in the management of chronic subacromial pain syndrome? A double-blinded randomized clinical trial with 9 to 14 years' follow-up. *J Shoulder Elbow Surg*. 2017;26:1407-1415. https://doi.org/10.1016/j.jse.2017.03.021
14. Kuhn JE, Dunn WR, Sanders R, et al. Effective-

ness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study. *J Shoulder Elbow Surg*. 2013;22:1371-1379. https://doi.org/10.1016/j.jse.2013.01.026
15. Kukkonen J, Joukainen A, Lehtinen J, et al. Treatment of non-traumatic rotator cuff tears: a randomised controlled trial with one-year clinical results. *Bone Joint J*. 2014;96-B:75-81. https://doi.org/10.1302/0301-620X.96B1.32168
16. Kyu HH, Bachman VF, Alexander LT, et al. Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013. *BMJ*. 2016;354:i3857. https://doi.org/10.1136/bmj.i3857
17. Lewis J. Bloodletting for pneumonia, prolonged bed rest for low back pain, is subacromial decompression another clinical illusion? *Br J Sports Med*. 2015;49:280-281. https://doi.org/10.1136/bjsports-2014-094367
18. Lewis J. The medicalisation of normality in musculoskeletal practice [abstract]. *J Sci Med Sport*. 2017;20 suppl 3:37. https://doi.org/10.1016/j.jsams.2017.09.266
19. Lewis J. Rotator cuff related shoulder pain: assessment, management and uncertainties. *Man Ther*. 2016;23:57-68. https://doi.org/10.1016/j.math.2016.03.009
20. Lewis J, McCreesh K, Roy JS, Ginn K. Rotator cuff tendinopathy: navigating the diagnosis-management conundrum. *J Orthop Sports Phys Ther*. 2015;45:923-937. https://doi.org/10.2519/jospt.2015.5941
21. Lewis JS. Rotator cuff tendinopathy. *Br J Sports Med*. 2009;43:236-241. https://doi.org/10.1136/bjsm.2008.052175
22. Lewis JS. Subacromial impingement syndrome: a musculoskeletal condition or a clinical illusion? *Phys Ther Rev*. 2011;16:388-398. https://doi.org/10.1179/1743288X11Y.0000000027
23. Lewis JS, Green A, Wright C. Subacromial impingement syndrome: the role of posture and muscle imbalance. *J Shoulder Elbow Surg*. 2005;14:385-392. https://doi.org/10.1016/j.jse.2004.08.007
24. McClelland D, Paxinos A, Dodenhoff RM. Rate of return to work and driving following arthroscopic subacromial decompression. *ANZ J Surg*. 2005;75:747-749. https://doi.org/10.1111/j.1445-2197.2005.03529.x
25. Mintken PE, McDevitt AW, Cleland JA, et al. Cervicothoracic manual therapy plus exercise therapy versus exercise therapy alone in the management of individuals with shoulder pain: a multicenter randomized controlled trial. *J Orthop Sports Phys Ther*. 2016;46:617-628. https://doi.org/10.2519/jospt.2016.6319
26. Moseley JB, O'Malley K, Petersen NJ, et al. A controlled trial of arthroscopic surgery for osteoarthritis of the knee. *N Engl J Med*. 2002;347:81-88. https://doi.org/10.1056/NEJMoa013259
27. Neer CS, 2nd. Anterior acromioplasty for the chronic impingement syndrome in the shoulder: a preliminary report. *J Bone Joint Surg Am*. 1972;54:41-50.
28. Neer CS, 2nd. Impingement lesions. *Clin Orthop Relat Res*. 1983:70-77.
29. Schrøder CP, Skare Ø, Reikerås O, Mowinckel P, Brox JI. Sham surgery versus labral repair or biceps tenodesis for type II SLAP lesions of the shoulder: a three-armed randomised clinical trial. *Br J Sports Med*. 2017;51:1759-1766. https://doi.org/10.1136/bjsports-2016-097098
30. Sihvonen R, Paavola M, Malmivaara A, et al. Arthroscopic partial meniscectomy versus sham surgery for a degenerative meniscal tear. *N Engl J Med*. 2013;369:2515-2524. https://doi.org/10.1056/NEJMoa1305189
31. Steuri R, Sattelmayer M, Elsig S, et al. Effectiveness of conservative interventions including exercise, manual therapy and medical management in adults with shoulder impingement: a systematic review and meta-analysis of RCTs. *Br J Sports Med*. 2017;51:1340-1347. https://doi.org/10.1136/bjsports-2016-096515
32. Vitale MA, Arons RR, Hurwitz S, Ahmad CS, Levine WN. The rising incidence of acromioplasty. *J Bone Joint Surg Am*. 2010;92:1842-1850.