



Neurosurgical Forum LETTERS TO THE EDITOR

Stereotactic subcaudate tractotomy: Knight stood on 3 giants' shoulders

TO THE EDITOR: I read with fascination Marchi and colleagues¹² account of Geoffrey Knight's development of stereotactic subcaudate tractotomy and commend its authors for their detailed explanation of both its anatomy and his scientific rationale (Marchi F, Vergani F, Chiavacci I, et al: Geoffrey Knight and his contribution to psychosurgery. *J Neurosurg* [epub ahead of print June 17, 2016. DOI: 10.3171/2016.3.JNS151756]). However, to isolate the man and his operation from key British stereotactic and functional neurosurgeons of that post-war era is to lobotomize the story of its richness.¹⁶ The contributions of a trio of his pioneering contemporaries should be mentioned. Firstly, Sir Hugh Cairns who established the Nuffield Department of Surgery at Oxford, where I trained.¹⁵ Secondly, Sir Wylie McKissock who founded neurosurgery at Atkinson Morley Hospital, now part of St. George's Hospital in London, where I work.¹ Finally, F. John Gillingham in Edinburgh, whom I came to know first as my patient and then as a friend and inspiration in his final years.¹⁷

Rather than being first performed by Foltz and White in 1961 as the authors suggest, anterior cingulotomy, also known as dorsal or rostral cingulotomy, was first performed for the treatment of psychiatric disorders in 1948 in Oxford by Cairns, albeit freehand before the advent of stereotactic surgery. Cairns extirpated by craniotomy and interhemispheric approach the anterior 4 cm of supragenual cingulate gyrus (Brodmann's Area 24). He published long-term outcomes from 24 of 29 treated patients with psychiatric disorders, showing improvements in many without detrimental changes in behavior and finding the treatment least effective in psychoses and most useful in "certain types of mental illness marked by obsessions, tension and anxiety, in which the basic personality is preserved."²⁰

As with Knight's subgenual cingulate region target, Cairns' dorsal anterior cingulate target has also been vindicated by a vast scientific literature from animal models and human brain imaging implicating the structure as dysfunctional in most psychiatric disorders and also in chronic pain. A recent open-label clinical trial from our Oxford team has suggested that it is a novel target for deep brain stimulation in otherwise neuromodulation-refractory central pain.²

Gillingham, with the Parisian neurosurgeon Gerard Guiot, pioneered awake, freehand pallidotomy for Parkinson's disease in 1953, utilizing a subfrontal approach to the anterior perforated substance that interrupted the ansa lenticularis.⁷ He treated 1 patient in Edinburgh in 1955 and a second in 1957 and reported long-term improvements in tremor, rigidity, and quality of life. However, wishing to avoid the demanding subfrontal approach, he modified Guiot's stereotactic parasagittal approach to an occipital one, developing the Guiot-Gillingham stereotactic apparatus in the process.⁶ In 1960 he published results from stereotactic "thermal electrocoagulation lesions of the globus pallidus, internal capsule and thalamus either separately or in combination" in a further 58 patients operated upon from 1957 to 1959.⁵ It is likely that Knight was audience to one of Gillingham's many presentations of framed stereotactic lesioning via subfrontal, parasagittal, and occipital approaches, and he adopted Gillingham's stereotactic subfrontal approach half a decade later for his first subcaudate tractotomy in 1961.

McKissock was born the same year as Knight and died at the same age. An assiduous British proponent of neurosurgery for psychiatric disorders,¹⁸ he favored a freehand approach to the frontal lobe from above.¹⁰ He described the rostral leukotomy in 1951 as a rejoinder to Freeman and Watt's transorbital "ice-pick" leukotomy, which he considered to contravene "established aseptic surgical principles."^{13,14} McKissock's immense practice covering swathes of South England and Wales and his reputation for extraordinary surgical speed inculcated a peripatetic service visiting other hospitals with his surgical instrument set in his car, drawing parallels with Freeman.¹ In 1961, Tooth and Newton reported that 10,365 leukotomies were performed in the United Kingdom between 1942 and 1954,¹⁹ and it has been suggested that McKissock alone may have performed one-quarter of these procedures. McKissock was less convinced by the merits of stereotactic over freehand approaches in reducing complications than Knight. The two presented their freehand outcomes back to back in 1959, by which time McKissock reported having performed nearly 3 times as many psychosurgeries as Knight.^{11,13}

It is therefore great testament to Knight that the Atkinson Morley neurosurgeon Alan Richardson—profoundly influenced by his mentor McKissock, as all around the great man were—developed a stereotactic approach for his psychiatric procedures.¹⁰ He combined Knight's subcau-

date tractotomy with Foltz and White's selective rostral cingulotomy to invent the procedure of limbic leukotomy in the early 1970s.^{8,9} Like Knight's subcaudate tractotomy, Richardson's limbic leukotomy continues to be performed in carefully selected cases refractory to medical treatment.¹⁵

Gildenberg has suggested 4 tenets that characterize the field of functional neurosurgery: 1) the need to be innovative, 2) that functional neurosurgery is a science, 3) that functional neurosurgeons work as a community not in isolation, and 4) that there is also appreciation for the insight and courage of true pioneers.⁴ Knight worked not in isolation but within such a neurosurgical community, and the centers that these 3 British giants of neurosurgery founded continue to exemplify such principles.

Finally, the authors do not mention that most of Knight's patients called him either "Professor Knight" or "Sir Geoffrey," presumably because even though he was neither, he ought to have been.³ The myth that Knight was knighted has crossed the Atlantic and pervades functional neurosurgery folklore to this day. I witnessed a compelling lecture in April 2016 by G. Rees Cosgrove, at a masterful lesioning course deftly assembled as ever by raconteur Marwan Hariz, where subcaudate tractotomy was explained and several references made to "Sir Geoffrey." I am sure that Professor Cosgrove, Professor Hariz, and the article's senior author, Professor Ashkan, would agree that he ought to have been Professor Knight. Perhaps Sir Hugh and Sir Wylie might even have concurred that he should have been honored Sir Geoffrey.

Erlick A. C. Pereira, DM, FRCS

Academic Neurosurgery Unit, University of London and
Atkinson Morley Neurosciences Centre, St. George's Hospital,
London, United Kingdom

References

- Bell BA: Wylie McKissock—reminiscences of a commanding figure in British neurosurgery. **Br J Neurosurg** **10**:9–18, 1996
- Boccard SG, Fitzgerald JJ, Pereira EA, Moir L, Van Hartevelt TJ, Kringelbach ML, et al: Targeting the affective component of chronic pain: a case series of deep brain stimulation of the anterior cingulate cortex. **Neurosurgery** **74**:628–637, 2014
- Bridges PK: Obituaries: Geoffrey Cureton Knight. **BJPsych Bull** **18**:653–654, 1994
- Gildenberg PL: Stereotactic surgery: the early years (comment). **Neurosurgery** **55**:1214, 2004
- Gillingham FJ, Watson WS, Donaldson AA, Naughton JA: The surgical treatment of parkinsonism. **Br Med J** **2**:1395–1402, 1960
- Guiot G: Le traitement des syndromes parkinsoniens par la destruction du pallidum interne. **Neurochirurgia (Stuttgart)** **1**:94–98, 1958
- Guiot G, Brion S: Traitement des mouvements anormaux par la coagulation pallidale; technique et resultats. **Rev Neurol (Paris)** **89**:578–580, 1953
- Kelly D, Richardson A, Mitchell-Heggs N: Stereotactic limbic leukotomy: neurophysiological aspects and operative technique. **Br J Psychiatry** **123**:133–140, 1973
- Kelly D, Richardson A, Mitchell-Heggs N, Greenup J, Chen C, Hafner RJ: Stereotactic limbic leukotomy: a preliminary report on forty patients. **Br J Psychiatry** **123**:141–148, 1973
- Kitchen N: Neurosurgery for affective disorders at Atkinson Morley's Hospital 1948–1994. **Acta Neurochir Suppl** **64**:64–68, 1995
- Knight GC: Discussion on psychosurgery. **Proc R Soc Med** **52**:209–210, 1959
- Marchi F, Vergani F, Chiavacci I, Gullan R, Ashkan K: Geoffrey Knight and his contribution to psychosurgery. **J Neurosurg** [epub ahead of print June 17, 2016. DOI: 10.3171/2016.3.JNS151756]
- McKissock W: Discussion on psychosurgery. **Proc R Soc Med** **52**:206–209, 1959
- McKissock W: Rostral leucotomy. **Lancet** **2**:91–94, 1951
- Pereira EA, Aziz TZ: Reincarnating the Oxford cingulotomy in the epoch of stereotaxy and resurrecting lesions in the era of deep brain stimulation. **Stereotact Funct Neurosurg** **91**:262–263, 2013
- Pereira EA, Green AL, Nandi D, Aziz TZ: Stereotactic neurosurgery in the United Kingdom: the hundred years from Horsley to Hariz. **Neurosurgery** **63**:594–607, 2008
- Pereira EA, Schweder PM, Green AL, Aziz TZ: Biographical sketch: F. John Gillingham. **Br J Neurosurg** **23**:143–146, 2009
- Richardson AE: Sir Wylie McKissock. **Surg Neurol** **30**:173–174, 1988
- Tooth J, Newton M: **Leucotomy in England and Wales 1942–1954: Report on Public Health and Medical Subjects No. 104**. London: Her Majesty's Stationery Office, 1961
- Whitty CWM, Duffeld JE, Tow PM, Cairns H: Anterior cingulotomy in the treatment of mental disease. **Lancet** **1**:475–481, 1952

Disclosures

The author reports no conflict of interest.

INCLUDE WHEN CITING

Published online November 4, 2016; DOI: 10.3171/2016.7.JNS161635.

©AANS, 2016