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Review

Women pioneers in basal ganglia surgery

Gun-Marie Hariz [a,b], Stig Rehncrona [c], Patric Blomstedt [a], Patricia Limousin [d], Katarina Hamberg [e], Marwan Hariz [a,d,*]

[a] Department of Clinical Neuroscience, Umeå University, Umeå, Sweden
[b] Department of Community Medicine and Rehabilitation, Occupational Therapy, Umeå University, Umeå, Sweden
[c] Department of Neurosurgery, Lund University, Lund, Sweden
[d] UCL Institute of Neurology, Queen Square, London, UK
[e] Department of Public Health and Clinical Medicine, Family Medicine, Umeå University, Umeå, Sweden

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ABSTRACT

Background: Stereotactic functional neurosurgery on basal ganglia has a long history and the pioneers are mostly men. We aimed at finding out if there were women who have contributed pioneering work in this field.
Methods: The literature was searched to identify women who have been first to publish innovative papers related to human basal ganglia surgery.
Results: Six women fulfilling our criteria were found: Marion Smith, a British neuropathologist, made unique observations on stereotactic lesions of basal ganglia and thalamus on autopsied brains, and the lesions' relation to the reported clinical outcome. Natalia Bechtereva, a Russian neurophysiologist, pioneered the technique of therapeutic chronic deep brain stimulation to treat various brain disorders, including Parkinson's disease (PD). Denise Albe-Fessard, a French neurophysiologist, pioneered the technique of microelectrode recording (MER) in stereotactic functional neurosurgery. Gunvor Kullberg, a Swedish neurosurgeon, contributed in early CT imaging as well as early functional imaging of stereotactic lesions in PD and psychiatric patients. Hilda Molina, a Cuban neurosurgeon, established the Centro Internacional de Restauración Neurológica (CIREN) and pioneered there MER-guided transplant surgery in PD patients. Veerle Vandewalle, a Belgian neurosurgeon, pioneered in 1999 deep brain stimulation (DBS) for Tourette Syndrome.
Conclusion: Although men constitute the great majority of neurosurgeons, neurologists and other neurospecialists who have made groundbreaking contributions in basal ganglia surgery, there are women who have made equally important and unique contributions to the field. The principal two techniques used today in functional stereotactic neurosurgery, MER and DBS, have once upon a time been pioneered by women.

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1. Introduction

Ever since the introduction of human stereotactic neurosurgery by neurologist Ernst Spiegel and neurosurgeon Henry Wycis in 1947, this field has attracted the interest of many neuroscientists and clinicians from virtually all specialties dealing with the brain: neurosurgeons, neurologists, neurophysiologists, neuropathologists, neuroradiologists, etc. Pioneers in these various fields, who have in common the use of the stereotactic methodology to study and treat functional brain disorders, were and are many, and virtually all of them are men [1,2].

Here we aim at finding out if there are women who have had a pioneering role in this field, and whose innovative contributions merit to be better known.

2. Methods

A survey of the scholar literature from the 1950s and onwards, including a survey of published proceedings from international stereotactic neurosurgical meetings, was conducted in order to identify women who have been first to publish ground-breaking or innovative papers related to human stereotactic functional neurosurgery. We considered pioneering work related to the topic

* Corresponding author. UCL Institute of Neurology, Box 146, Queen Square, London WC1H 9QW, UK. Tel.: +44 79 8564 2852; fax: +44 20 7419 1860.
E-mail addresses: m.hariz@ucl.ac.uk, marwan.hariz@neuro.umu.se (M. Hariz).

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regardless of the country of origin, and regardless of whether the work was in the field of neurosurgery, neurology, neurophysiology, neuroradiology, or neuropathology, as long as it pertained to human stereotactic functional neurosurgery.

Identified women who were considered pioneers according to our criteria, and who are alive, were contacted and interviewed (in person, by email and/or on telephone), about their career and work. For the pioneer women who were no longer alive, we used asides from their publications, other sources such as the Internet, editorials, biographies or obituaries, in order to gather information about their path and career.

3. Results

Six women (one neuropathologist, two neurophysiologists, and three neurosurgeons) emerged as pioneers and innovators in the field of human functional stereotactic neurosurgery (Fig. 1). A summary of their careers and some of their prominent contributions are presented and commented below.

3.1. Marion Smith

Marion Smith was a Glasgow-trained anatomist and neuropathologist who worked at the National Hospital at Queen Square in London. She passed away in 1988. She was well known for questioning dogma in the literature and for her exquisite anatomic knowledge [3]. Her main and pioneering contribution in functional stereotactic neurosurgery was in analyzing systematically in brain specimens the location and extent of stereotactic lesions such as thalamotomy and pallidotomy for Parkinson's disease, and correlating the findings to the clinical results of surgery as had been reported in the patients' notes by the neurosurgeons [4,5]. One of her most interesting and comprehensive papers was published in the Journal of Neurosurgery in 1966 entitled "Pathological changes associated with stereotactic lesions in Parkinson's disease" [5]. In this very detailed and illustrated study, she examined 33 brains from operated parkinsonian patients and showed the considerable scattering of the lesions all over the basal ganglia, thalamus and internal capsule, and she highlighted the absence of correlation between the location and size of the lesions and the *reported* clinical results of surgery. Several lesions lying in very different locations and of very variable size were reported in the patients' notes as "successful". In her witty way she commented on that as follows: "Further the whole question of what is meant by a successful result and whether or not this interpretation can be accepted when a patient had survived only a few days after the operations, is open to discussion. Nevertheless, most of us know what is meant by a surgeon statement that the operation achieved a satisfactory result…" [5].

Fig. 1. The six women who made pioneering contributions in functional stereotactic neurosurgery: M.S. Marion Smith; N.B. Natalia Bechtereva; D.A-F. Denise Albe-Fessard; G.K. Gunvor Kullberg; H.M. Hilda Molina; V.V-V. Veerle Visser-Vandewalle. Notes to Figure: §. Photo of Marion Smith: Courtesy The National Hospital for Neurology and Neurosurgery, Queen Square, London, UK. §. Photo of Natalia Bechtereva: Courtesy Professor Tipu Aziz, Oxford, UK. §. Photo of Denise Albe-Fessard: Available in Ref. [15], a document freely available to download from: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDUQFjAB&url=http%3A%2F%2Fwww.sfn.org%2Fskins%2Fmain%2Fpdf%2Fhistory_of_neuroscience%2Fhon_vol_1%2Fc1.pdf&ei=5T8EUZq1HPOr0AXVvIHADQ&usg=AFQjCNH3BQP0X4GgMqh__PfslOHLAjlISw&bvm=bv.41524429,d.d2k. §. Photo of Gunvor Kullberg: provided by Dr. Kullberg for this publication. §. Photo of Hilda Molina: provided by Dr. Molina for this publication. §. Photo of Veerle Visser-Vandewalle: provided by Dr. Visser-Vandewalle for this publication.

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