

# Changes in Patient Profile and Neurosurgical Procedures in a Large Military Hospital in Colombia Before and After the Peace Process: A Retrospective Analysis of Clinical Records

*H Palmera Pineda, F Montoya, D Rosselli, L Estrada, K Luengas, J C Luque*

## Abstract

**Aim:** Colombia concluded a peace agreement with its largest guerrilla group (known as FARC) in 2016. The study aimed to compare neurosurgical procedures performed at the largest national military hospital during a two-year period at the height of the armed conflict (2003–2004) with a similar period around the official signing of the agreement (2015–2017).

**Methods:** Clinical records of all patients undergoing neurosurgical procedures from January 2003 to December 2004 and from July 2015 to June 2017 were reviewed. Demographic variables and procedures were analysed through basic descriptive statistics.

**Results:** 527 patients' records were retrieved from the first period and 871 from the second; patients were predominantly male (71% and 61%, respectively). Median age increased from 35 years in the first period to 50 years in the second; active personnel decreased from 60% to 31%. Trauma represented 170 of 313 cranial surgeries (54%) in the first period and 96 of 571 (17%) in the latter.

**Conclusion:** Patient profile in this military institution changed from being a war hospital in the middle of the conflict to one with a more 'civilian' pattern of procedures.

**Keywords:** Armed Conflicts; Colombia; Hospital Militar; Military Medicine; Neurosurgery; Neurosurgical procedures.

**Conflict of interest:** The authors certify that they have NO affiliations with or involvement in any organisation or entity with any financial. One of the authors (JCL) is a retired Colonel of the Army; another (FAM) is currently Captain of the Colombian Army.

## Introduction

The Central Military Hospital (Hospital Militar Central or HMC), in the capital city of Bogotá, has been the main reference centre for Colombian military personnel and their families when they require high degrees of subspecialty expertise since its establishment in 1962.<sup>1</sup> It is a 450-bed hospital; 100 of them in the four intensive care units. The Colombian Military Health System covers close to one million active and retired military personnel,

their families, as well as civilians who are part of the Colombian Ministry of Defence. Due to the long-standing internal conflict with guerrilla groups, including the Revolutionary Armed Forces of Colombia (FARC), the HMC has gained important experience in conflict-related severe trauma.<sup>2,3</sup> Several of our publications have recorded the experience in large series of facial gunshot wounds<sup>4,5</sup> and other forms of severe trauma.<sup>6</sup>

Neurosurgical procedures in military hospitals tend to concentrate a large proportion of trauma-related

interventions,<sup>7</sup> particularly when conflicts arise.<sup>8</sup> In peacetime, military neurosurgeons tend to deal with similar patients to their civilian peers.<sup>9</sup> This patient profile change has been described in Bulgaria transitioning from a conflict-ridden Communist republic to a democracy.<sup>6</sup>

According to the National Centre for Historic Memory (Centro Nacional de Memoria Histórica), in Colombia from 1958 to 2012, there were an estimated 218 094 conflict-related deaths, 81% of which were civilians.<sup>10</sup> The highest death toll occurred in 2003–2004<sup>12</sup> with almost 2000 annual conflict-related deaths.<sup>11</sup>

The objective of this study was to compare the sociodemographic profile of neurosurgical patients and the surgical procedures performed at the HMC before and after the Havana Peace Process, signed between the Colombian government and the FARC in Cuba and ratified by Congress in November 2016.<sup>13</sup>

## Methods

The clinical records of all patients undergoing neurosurgical procedures during two different periods were retrospectively analysed. The first period went from January 2003 to December 2004, at the peak of the armed conflict. The second period went from July 2015 to June 2017, around the time the Peace Agreement was signed and ratified. The HMC lacked electronic health records during the first period, and data were retrieved manually. Much valuable information was missing in many of the records in this first group, such as the length of stay, both in the general ward and ICU, and military rank and force; this subsample is reported separately. Data retrieved included gender, age, occupation (rank and force), primary diagnosis and surgical procedures (classified in subcategories).

All information was collected in pre-designed Excel spreadsheets. In order to analyse the data, frequencies of each variable were obtained, qualitative variables were organised into categories, and descriptive statistical analysis included chi-square and two-tailed *t*-Student tests. For statistical significance, we assumed a *p*-value lower than 0.05. For the chi-square test, when more than 20% of the cells showed a value of expected frequency lower than 5, Fisher's exact test was used.

The research protocol was reviewed and approved by the institution's ethics committee.

## Results

A total of 1 398 patient records were retrieved, 527 from the first period and 871 from the second one (Table 1). The sample was predominantly male, more so in the first period than in the second. As can be seen when comparing means, median or interquartile range, the patients in the first period were younger; a higher proportion were active military personnel. When considering active personnel only, there were no differences in distribution by force (Army, Navy and Air Force) or rank. The main cause of cranial surgery during the period prior to the signing of the Peace Agreement was trauma, while in the post-agreement period, it was vascular pathology. For its part, degenerative spinal pathology was the most important cause of spinal surgery in both periods; however, there was a significant decrease in spinal trauma in the post-agreement period (Table 2).

**Table 1. General characteristics of the 527 neurosurgical patients from the first period (2003–2004) and the 871 from the second period (2015–2017).**

	2003–2004		2015–2017
	N=251	N=276*	N=871
<b>Age (years)</b>			
<b>Range</b>	18–85	18–85	18–94
<b>Mean (SD)</b>	40 (17)	41 (18)	51 (19)**
<b>Median (IQR)</b>	36 (25–51)	35 (26–55)	50 (36–68)**
<b>Males</b>	196 (78%)	180 (65%)	532 (61%)**
<b>Active personnel</b>	153 (60%)		273 (31%)**
<b>Rank</b>			
<b>Officers</b>	17 (11%)		34 (12%)
<b>NCO</b>	53 (34%)		96 (35%)
<b>Soldiers</b>	83 (54%)		142 (52%)
<b>Force</b>			
<b>Army</b>	131 (86%)		237 (87%)
<b>Navy</b>	17 (11%)		20 (7%)
<b>Air Force</b>	5 (3%)		16 (6%)

*SD* standard deviation; *IQR* interquartile range; *NCO* non-commissioned officers

\* These patients had missing data in their clinical records

\*\*  $p < 0.001$

**Table 2. Main neurosurgical procedures classified by surgical site and broad categories. Percentages may not add up to 100% due to rounding.**

	2003–2004		2015–2017	
	Cranial surgery N=313	Spinal surgery N=214	Cranial surgery N=571	Spinal surgery N=301
<b>Trauma</b>	170 (54%)	28 (13%)	96 (17%)**	23 (8%)**
<b>Tumour</b>	54 (17%)	10 (5%)	153 (27%)	14 (5%)
<b>Vascular</b>	32 (10%)	2 (1%)	228 (40%)	3 (1%)
<b>Infection</b>	17 (5%)	8 (4%)	16 (3%)	2 (1%)
<b>Degenerative</b>		151 (51%)		249 (83%)
<b>Other</b>	40 (13%)	15 (7%)	78 (14%)	10 (3%)

\*\*  $p < 0.001$  for comparisons between the two time periods

## Discussion

The results presented in this paper show a significant change in one of the surgical departments involved in treating military personnel both during the decades-long armed conflict and in the months surrounding the Colombian Peace Agreement. There have been no significant changes in the population covered by the Colombian Military Health System during this period. Surgical activity is closer to what is expected in a civilian environment, which has seen new technologies introduced in the neurosurgical like minimally invasive techniques, radiosurgery or endovascular procedures. However, together with the medical school of the Military University, the hospital keeps training in trauma management, primarily through its simulation laboratory.

The Colombian peace process took advantage of the lessons of other similar agreements, like the one that ended apartheid in South Africa in the early nineties.<sup>14</sup> Both had strong opposition coming from powerful politicians and a large part of the population.<sup>15</sup> In both cases, fear was used as a weapon to demonise the enemy and to exaggerate events whenever something violent happened in the long process of both of these agreements.

The effects of war on health have been amply discussed,<sup>16,17</sup> and there is an extensive list of both

direct and indirect effects; in Colombia, internal displacement and its social and economic effects are of great importance in many health-related aspects, particularly for the most vulnerable.<sup>18,19</sup> Mental health, both in the military<sup>20</sup> and in the civilian population,<sup>21</sup> has also been the topic of some research. In this paper, we address the direct effects of neurosurgical trauma derived from the Colombian armed conflict on military personnel, an aspect that has not been sufficiently covered in the academic literature.

Despite the limitation of some missing data in the first sample, our results show that highly trained medical specialists that were once dedicating most of their time and medical resources to conflict-related trauma in young men are now involved in a new set of neurosurgical procedures in a vastly different target population. The social value of this trend, though difficult to quantify, must be significant.

*Corresponding Author:*

Harold Palmera Pineda, [har9hol@gmail.com](mailto:har9hol@gmail.com)

*Authors:* H Palmera Pineda<sup>1</sup>, F Montoya<sup>2</sup>, D Rosselli<sup>2</sup>, L Estrada<sup>2</sup>, K Luengas<sup>2</sup>, J C Luque<sup>2</sup>

*Author Affiliations:*

1 Universidad Militar Nueva Granada

2 Bogota Colombia

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