

WG 8 (Aerospace Medicine)

## Correlations Between Clinical Spinal Features and MRI Findings

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### Introduction:

Spinal pain is a significant challenge in air forces, as Neck Pain (NP) or Lower Back Pain (LBP) can impair pilots' functioning. Although studies on the general population showed no strong correlation between MRI findings and NP or LBP, data on aircrews is limited. This study aims to assess the association between clinical and MRI findings among aircrews with spinal pain.

### Method:

Data from Israeli Air Force aircrew members experiencing NP or LBP and who underwent MRI between 2019–2025 were analyzed. Collected data included demographics such as age and sex, basic anthropometrics, occupational data such as aircraft and position, clinical findings assessed by a doctor and/or physiotherapist and MRI findings. MRI severity was graded by a blinded, experienced orthopedic surgeon.

### Results:

51 aircrew members (mean age  $31.93 \pm 6.18$  years) were included in our study. 64% were jet pilots, 18% helicopter pilots, and 18% transport aircraft operators. LBP pain affected 70% and NP affected 62% of the participants. Axial pain was reported by 46%, referred pain by 40%, and combined symptoms by 14%. MRI findings showed disc pathology in 78%, mainly bulges (30%) and herniations (28%), which significantly correlated with neurological symptoms ( $p=0.043$ ) and positive Spurling tests ( $p=0.021$ ). Cord compression was associated with pain location ( $p=0.018$ ), particularly in cases of isolated cervical pain, where 50% showed signs of canal stenosis or cord compression. Higher MRI severity correlated with limited range of motion (ROM) ( $p=0.031$ ).

### Discussion:

Most aviators with severe spinal pathology requiring further imaging were fighter pilots, consistent with prior research by our institute. The predominant clinical and imaging findings were axial pain and disc bulging, similar to the non-aviators population. In most of the cases, in addition to pain there were accompanying neurological symptoms.

Our Analysis showed that spinal cord compression was highly associated with isolated cervical pain but not with limb weakness or gait disturbances, differing from the general population. Additionally, decreased ROM was strongly associated with the extent of MRI findings, highlighting the importance of thorough physical examination in order to predict those with severe pathology.

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## Prospective Analysis of Cervical Health Parameters in Military Pilot Cadets: From Pre-Flight to Training Progression

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### Background:

Spinal pain, particularly cervical pain, is a recognized occupational hazard for military pilots, exacerbated by high G-forces and constrained cockpit postures. This can lead to neurological deficits and reduced operational readiness. Existing research highlights the need for preventative strategies.

### Purpose and Goals:

This prospective study aims to establish baseline measurements of cervical strength, range of motion (ROM), and anthropometry in Israeli Air Force flight cadets prior to extensive flight exposure. The primary objectives are to; 1) track the longitudinal evolution of these measures throughout the pilot training course; and 2) investigate the association between objective (strength, ROM, anthropometry) and subjective (pain, function) cervical measures.

### Methods:

Four hundred flight cadets (aged 18-25) from four consecutive pilot courses will be recruited. Cervical ROM will be assessed using a validated virtual reality system (XRHealth™ Oculus Quest VIVE HTC VR™). Cervical muscle strength will be evaluated using a Microfet 2 dynamometer (Hoggan Scientific). Anthropometric measurements will include neck circumference and length. Subjective cervical pain and function will be assessed via validated questionnaires. Measurements will be taken at baseline (one year into the course, prior to flight exposure) and at two and three years into the course.

### Possible Implementations:

The resulting baseline data will inform the development and implementation of targeted exercise interventions aimed at mitigating cervical pain and improving pilot performance and operational readiness. Longitudinal data will elucidate the evolution of cervical health during pilot training.