

28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Retinal layers parameters assessment as biomarkers after rugby players' head trauma

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INTRODUCTION:

The consequences of mild traumatic brain injuries and sports-related concussions are a challenge for clinicians, players, coaches and parents involved in contact sports. Retinal layers' changes have been reported in numerous neurodegenerative diseases. The aim of this study was to investigate longitudinally the retinal thickness changes and their association with concussion during one rugby season in professional rugby players, using spectral domain (SD) - optical coherence tomography (OCT).

METHODS:

This is a longitudinal prospective cohort study. All patients were members of the Racing 92 rugby team (Paris, France). The first ophthalmological visit was performed before the beginning of the season, then a second visit was planned the following year just before the beginning of the next season. During the season, participants were closely followed by the teams' medical staff and the number of concussions was reported. At each ophthalmological examination, all participants had SD-OCT and OCT-angiography, which allowed the measurement of peripapillary and macular thicknesses.

RESULTS:

Among the 59 rugby players included at baseline, 36 were followed during one year and had one final visit after the season. Mean Retinal Nerve Fiber Layer (RNFL) thickness decreased significantly between the initial and the final visit ($102.65 \pm 7.01 \mu\text{m}$ vs. $101.46 \pm 7.14 \mu\text{m}$, $p=0.0001$). There was also a significant decrease of the mean ganglion cell layer (GCL) volume ($1.16 \pm 0.08 \text{ mm}^3$ vs. $1.14 \pm 0.09 \text{ mm}^3$, $p<0.0001$) and of the mean macular vascular density ($19.71 \pm 3.01 \%$ vs. $19.36 \pm 3.03 \%$, $p = 0.0002$).

Among those 36 patients, 5 (13.9%) suffered from at least one concussion during the follow up. Mean RNFL loss was significantly higher in rugby players who had at least one concussion during the follow up ($n=5$, $-3.9 \pm 1 \mu\text{m}$) in comparison with those who had no concussion ($n=31$, $-0.8 \pm 1.2 \mu\text{m}$) ($p = 0.0008$). No correlation was found between the number of concussions and the position of the rugby player in the team.

CONCLUSION:

RNFL loss was significant in professional rugby players, after only one season time, and was significantly higher in concussion group, showing the interest of SD-OCT in the assessment of head traumas' consequences in rugby players. OCT RNFL monitoring could be helpful for the management of concussions in rugby players. Further longitudinal studies are still needed to determine which level of RNFL loss should be a recommendation of sport cessation.

Topic: Sports Medicine and Orthopedics

Presentation: Oral

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