



Case report

**Spontaneous cerebral haemorrhage in a young weight lifter:
A case report and a review of current literature***Gabriele Cioni**Department of Experimental and Clinical Medicine, University of Florence, Italy*

ARTICLE INFO

Article history

Received 22 February 2017

Accepted 2 May 2017

Available online 2 March 2018

Keywords

Intracranial haemorrhage

Weight lifting

Anabolic steroids

Hypertensive damage

Doi

10.29089/2017.17.00024

User license

This work is licensed under a
Creative Commons Attribution –
NonCommercial – NoDerivatives
4.0 International License.



ABSTRACT

Introduction: Intracranial haemorrhage is the leading cause of death related to a head trauma in sports, and spontaneous cerebral bleedings are a very rare condition in young athletes.

Aim: We propose the case of a young weight lifter, androgenic anabolic steroids abuser, who developed a spontaneous massive intracranial haemorrhage during exertion.

Case report: The patient was a weight lifter at a competitive level, who had exercised on a regular basis for the past 5 years, assuming anabolic steroids and proteins for some years. Moreover, he referred a negative family history for spontaneous bleeding in the brain. At the visit time he presented very high blood pressure values.

Results and discussion: In this case report, the side of the cerebral lesion was typical for a hypertensive brain damage. High blood pressure values, and the alteration of sodium and potassium were compatible with hyperaldosteronism; moreover, cardiac ultrasound assessment showed a hypertrophic ventricle condition, secondary to a chronic untreated hypertension.

Conclusions: The chronic use of anabolic steroids could contribute to hypertensive complications, such as intracranial haemorrhages.

1. INTRODUCTION

The spontaneous intracranial haemorrhage is a very severe condition leading to neurological disability and associated to a high mortality rate.

It is a very rare condition in young subjects; its incidence increases after the age of 55 years, and it doubles after 80 years.¹

As reported in several studies, the intracranial haemorrhage is the leading cause of death secondary to a head trauma² during sport activity.³

Moreover, the dissection of cervical artery has been described in association with several sports, such as swimming⁴ and also following a trauma to the neck by a sea wave.⁵

Alaraj et al. reported about two young athletes, abusers of anabolic androgenic steroids, who developed a spontaneous subdural haematoma.⁶

2. AIM

We propose the case of a young weight lifter, abuser of androgenic anabolic steroids, who developed a spontaneous massive intracranial haemorrhage during an exertion.

3. CASE REPORT

A 30-years-old, previously healthy, man arrived to the Emergency Department for a severe headache resistant to acetaminophen, associated to nausea, vomiting and neurological abnormalities. In particular, he initially showed an aphasia and then a marked weakness of face, of the left upper limb and of the left lower limb. Neurological symptoms began during a training session. Patient denied any history of head trauma. He referred that, about a year before, he was hospitalized for a persistent headache, associated with elevated blood pressure values; on that occasion, he was positive to drug tests for the detection of anabolic steroids. According to its medical history, the patient was a weight lifter at a competitive level, who had exercised on a regular



Figure 2. The angiography tomography of the brain excluded arteriovenous malformations or 166 atherosclerosis of internal carotids.

basis for the past 5 years, assuming anabolic steroids and protein integrators. Moreover, he reported a negative family history for spontaneous cerebral bleedings.

At the visit time, he weighted 105 kg and presented elevated blood pressure values (190/100 mmHg). Physical examination showed bilateral papilloedema and conjunctival haemorrhage. Regarding biochemical parameters, we found high creatinine plasma levels associated to an alteration in sodium and potassium levels. The encephalic CT showed the presence of a right-sided lenticular haemorrhage (Figure 1A). The patient underwent to an echocardiogram, showing a hypertrophic left ventricle; the exam excluded the presence of a patent foramen ovale. Subsequently, we performed a cerebral

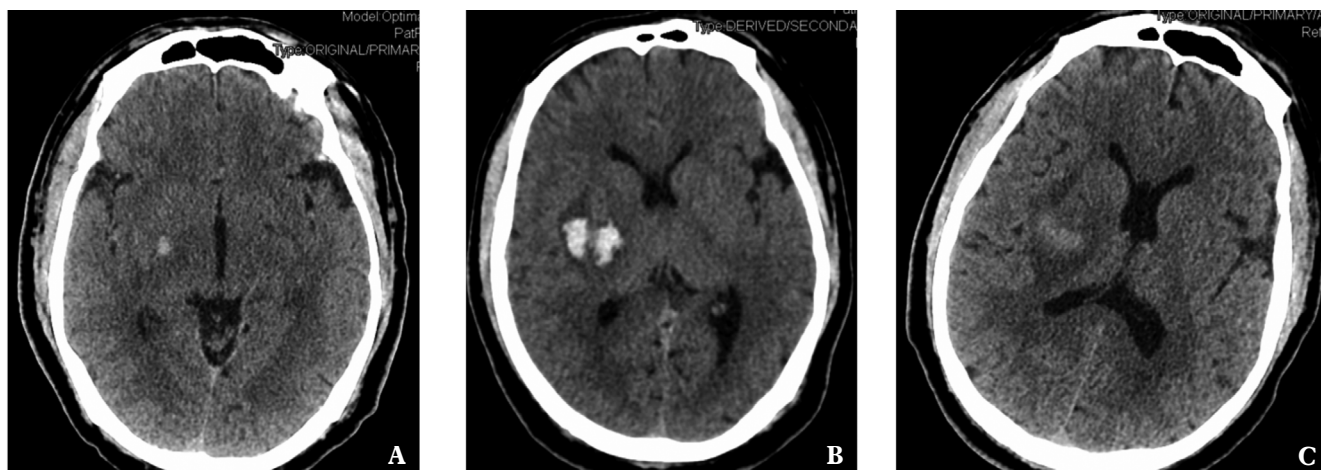


Figure 1. Several CT scans of the brain showing the progression of the haemorrhagic lesion at different times: at baseline (A), at 24 hours (B) and after 1 week (C).

CT angiography, which had excluded intracranial vascular malformations or severe atherosclerosis of internal carotids (Figure 2). The neurosurgeon excluded indications for surgery. At the 24-hours control (Figure 1B), the haemorrhage was significantly increased, showing the development of a large neurogenic oedema. These findings were associated to the progression of neurological abnormalities, with the onset of a complete paralysis of the left side. After a week, a new encephalic CT evidenced a partial reduction of the haemorrhagic area (Figure 1C).

4. RESULTS AND DISCUSSION

Although several cases of cerebral bleedings in sportsmen were reported, only Alaray et al.⁶ described two different cases of subdural haematoma in weight lifters.

According to epidemiological data, the anabolic steroid use is growing in the population of young athletes, with special reference to testosterone, nandrolone, stanozolol, or methandienone.⁷

The chronic use of anabolic steroids is widely associated to the development of a pro-thrombotic burden, because of the increase in thrombin and plasmin levels,⁸ and because of the deficiency of protein C,⁹ predictors of acute myocardial damage and peripheral arterial disease. A case of a young man who presented potentially life-threatening arterial thromboses during anabolic steroid assumption was previously described.¹⁰

Moreover, the use of anabolic steroids is associated to a significant increase in blood pressure values;¹¹ this phenomenon is probably related to the sensivity of endothelium to catecholamine levels, to the renin and aldosterone production, or to others pathways.¹² Data from a follow-up study, as reported by Pereira dos Santos et al., showed that these effects appeared to be relatively short lived;¹³ currently there is a lack in evidence on the use of steroids in the longer term. A recent study reported the association between recreational of anabolic steroid use and arterial hypertension and hyperlipidemia;¹⁴ Severo et al. reported that changes in lipid profile, were associated to an increase in inflammatory markers and endothelial dysfunction.¹⁵

In this case report, the side of the cerebral lesion was typical for a brain damage on hypertensive basis.

The elevation in blood pressure values, and the alteration of serum electrolytes, were compatible with the presence of a drug-related hyperaldosteronism; moreover, the cardiac ultrasound assessment showed a hypertrophy of left ventricle, likely secondary to a chronic untreated hypertension.^{16,17} A retrospective study, suggested a causative role in the pathogenesis of sudden cardiac deaths of anabolic steroids; in particular, authors identified several pathological changes within the myocardium of the left ventricle, such as interstitial and perivascular fibrosis, and fibroadipous metaplasia and perineural fibrosis.¹⁸ Chronic use of anabolic steroids was associated to a depression in left ventricular function; moreover, steroids-using bodybuilders presented a reduced

diastolic functions of both ventricles.¹⁹ A case of a myocardial infarction in a young body builder was previously reported.²⁰ However, long term effects of weight lifting and of the abuse of anabolic steroids on myocardial fibres and on peripheral vasculature, are still argument of research.⁷

5. CONCLUSIONS

The weightlifting is associated with the increase in blood pressure values and with alterations on myocardial fibres,⁷ but these effects seem to be reversible. However, the chronic use of anabolic steroids could contribute to hypertensive complications,^{16,17} such as intracranial haemorrhages.

Conflict of interest

None declared.

References

- 1 Broderick J, Connolly S, Feldmann E, et al. Guidelines for the management of spontaneous intracerebral hemorrhage in adults: 2007 update: a guideline from the American Heart Association/American Stroke Association Stroke Council, High Blood Pressure Research Council, and the Quality of Care and Outcomes in Research Interdisciplinary Working Group. *Circulation*. 2007;116(16):e391–e413. <https://doi.org/10.1161/CIRCULATIONAHA.107.183689>.
- 2 Cantu RC. Head injuries in sport. *Br J Sports Med*. 1996;30(4):289–296. <https://doi.org/10.1136/bjism.30.4.289>.
- 3 Abe A, Nishiyama Y, Kamiyama H, Kitahara I, Katsura K-I, Katayama Y. Symptomatic middle cerebral artery dissection in a young tennis player. *J Nippon Med Sch*. 2009;76(4):209–211. <https://doi.org/10.1272/jnms.76.209>.
- 4 Mohaghegh S, Hajian M. Stroke in a Young Swimmer. *Asian J Sports Med*. 2015;6(2):e23812. <https://doi.org/10.5812/asjism.23812v2>.
- 5 Pego-Reigosa R, López-López S, Vázquez-López ME, et al. Sea wave-induced internal carotid artery dissection. *Neurology*. 2005;64(11):1980. <https://doi.org/10.1212/01.WNL.0000163855.78628.42>.
- 6 Alaraj AM, Chamoun RB, Dahdaleh NS, Haddad GF, Co-mair YG. Spontaneous subdural haematoma in anabolic steroids dependent weight lifters: reports of two cases and review of literature. *Acta Neurochir (Wien)*. 2005;147(1):85–87. <https://doi.org/10.1007/s00701-004-0415-0>.
- 7 Di Bello V, Giorgi D, Bianchi M, et al. Effects of anabolic-androgenic steroids on weight-lifters' myocardium: an ultrasonic video densitometric study. *Med Sci Sports Exerc*. 1999;31(4):514–521. <https://doi.org/10.1097/00005768-199904000-00004>.
- 8 Ferenchick GS, Hirokawa S, Mammen EF, Schwartz KA. Anabolic-androgenic steroid abuse in weight lifters: evidence for activation of the hemostatic system. *Am J Hematol*. 1995;49(4):282–288. <https://doi.org/10.1002/ajh.2830490405>.

- ⁹ Kokkonen L, Anttonen O, Penttilä O, Voutilainen S. [Protein C deficiency and use of anabolic steroids behind the myocardial infarction in a young man]. *Duodecim*. 2001;117(22): 2279–2281 [in Finnish].
- ¹⁰ McCulloch NA, Abbas JR, Simms MH. Multiple arterial thromboses associated with anabolic androgenic steroids. *Clin J Sport Med*. 2014;24(2):153–154. <https://doi.org/10.1097/01.jsm.0000432854.77520.f3>.
- ¹¹ Kawajiri K, Kiyama M, Hayazaki K. Spontaneous dissection in the common carotid artery-case report. *Neurol Med Chir (Tokyo)*. 1995;35(6):373–376. <https://doi.org/10.2176/nmc.35.373>.
- ¹² Rossi GP, Seccia TM, Maniero C, Pessina AC. Drug-related hypertension and resistance to antihypertensive treatment: a call for action. *J Hypertens*. 2011;29(12):2295–2309. <https://doi.org/10.1097/HJH.0b013e32834c465d>.
- ¹³ Santos MA, Oliveira CV, Silva AS. Adverse cardiovascular effects from the use of anabolic- androgenic steroids as ergogenic resources. *Subst Use Misuse*. 2014;49(9):1132–1137. <https://doi.org/10.3109/10826084.2014.903751>.
- ¹⁴ Solakovic S, Totic D, Vukas H, Djedovic M. Hidden Danger of Irrational Abusing Illegal Androgenic-anabolic Steroids in Recreational Athletes Age Under 35 in Bosnia & Herzegovina. *Med Arch*. 2015;69(3):200–202. <https://doi.org/10.5455/medarh.2015.69.200-202>.
- ¹⁵ Severo CB, Ribeiro JP, Umpierre D, et al. Increased atherothrombotic markers and endothelial dysfunction in steroid users. *Eur J Prev Cardiol*. 2013;20(2):195–201. <https://doi.org/10.1177/2047487312437062>.
- ¹⁶ Hartgens F, Cheriex EC, Kuipers H. Prospective echocardiographic assessment of androgenic-anabolic steroids effects on cardiac structure and function in strength athletes. *Int J Sports Med*. 2003;24(5):344–351. <https://doi.org/10.1055/s-2003-40705>.
- ¹⁷ Jurca SJ, Elliott WJ. Common Substances That May Contribute to Resistant Hypertension, and Recommendations for Limiting Their Clinical Effects. *Curr Hypertens Rep*. 2016;18(10):73. <https://doi.org/10.1007/s11906-016-0682-1>.
- ¹⁸ Lusetti M, Licata M, Silingardi E, Reggiani Bonetti L, Palmiere C. Pathological changes in anabolic androgenic steroid users. *J Forensic Leg Med*. 2015;33:101–104. <https://doi.org/10.1016/j.jflm.2015.04.014>.
- ¹⁹ Kasikcioglu E, Oflaz H, Umman B, Bugra Z. Androgenic anabolic steroids also impair right ventricular function. *Int J Cardiol*. 2009;134(1):123–125. <https://doi.org/10.1016/j.ijcard.2007.12.027>.
- ²⁰ Wysoczanski M, Rachko M, Bergmann SR. Acute myocardial infarction in a young man using anabolic steroids. *Angiology*. 2008;59(3):376–378. <https://doi.org/10.1177/0003319707304883>.