

# ANTERIOR CRUCIATE LIGAMENT (ACL) INJURY AMONG BRAZILIAN INDIGENOUS POPULATION LIVING IN AMAZONAS

EDUARDO TELLES DE MENEZES STEWIE<sup>1</sup>, ELSON SANTOS DE MELO<sup>2</sup>, MAURICIO ALEXANDRE DE MENESES PEREIRA<sup>2</sup>, OSMAR PEDRO ARBIX DE CAMARGO<sup>3</sup>

## SUMMARY

In August 2003, 151 Ticuna Indians (88 males and 63 females) living in the surroundings of Tabatinga city in Amazonas state (Brazil) were examined for anterior cruciate ligament (ACL) injury using the International Knee Documentation Committee – IKDC2000 method. About 14% of males presented ACL injury, against 3% of female, and 88% of the population studied presented varus knee alignment.

The authors believe that the expressive rate of ACL injury in male Brazilian Indians was determined by cultural issues, probably because of soccer playing, with the isolation of the Ticuna village being critical for the lack of diagnosis and treatment.

**Keywords:** *Knee; Anterior cruciate ligament; Indigenous population; Physical examination.*

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## INTRODUCTION

Anterior cruciate ligament (ACL) is the major anterior stabilizer of the knee<sup>(1)</sup> and its rupture is mainly associated to an indirect mechanism of trauma followed by hemarthrosis<sup>(2)</sup>. The natural progression of this ligament injury remains unclear, but it is believed that the anterior instability may evolve to meniscal and chondral degenerative injuries<sup>(3-5)</sup> and the natural evolution is reflected on the performance of these individuals in their physical activities<sup>(6)</sup>.

In the USA, the annual incidence is estimated as 0.35 ACL injury/general population resident, resulting in approximately 75,000 injuries each year<sup>(7)</sup>. About 70% of the injuries occur during sports practice, especially during soccer playing, with most of these injuries occurring in individuals aged 16 – 45 years<sup>(8)</sup>. It was found that sportswomen showed an increased incidence of ACL injury when compared to men, but there is no convincing explanation for that<sup>(9)</sup>. In Brazil, there is still a lack of epidemiological data about knee ligament injuries in the overall population, or in the indigenous populations.

The Amazon region accounts for almost half of the entire Brazilian territory, with Amazonas being the biggest state of the federation, with such big dimensions that some geographical regions are overcome by it. The peculiar characteristics of the region make internal travels difficult, being usually made by river and by plane, a fact that makes access to health services difficult.

As a large portion of the orthopaedic doctors live in the capital city of that state, patients must travel by boat to seek orthopaedic care. Among indigenous populations, healthcare challenges are even more impressive, as a result of the geographical isolation, the indigenous culture itself, as well as of the different languages turning medical care difficult to be provided.

The objective of this study is to determine the incidence of ACL injury in an indigenous population village of the state of Amazonas,

upon a physical examination protocol based on the "International Knee Documentation Committee" – IKDC 2000<sup>(10)</sup>. In addition, this study is intended to: a) compare the differences found between genders, b) check for the association of ACL injuries with other ligament injuries, and c) check for the alignment of lower limbs, by gender and age.

## CASE SERIES AND METHODS

### Study population

The Orthopaedics and Traumatology Service of the Federal University of Amazonas' University Hospital Getúlio Vargas made a specialized healthcare visit to the indigenous settlement Umariçu II, located at Tabatinga city, Amazonas, aiming to examine the indigenous people from both sexes and in all age groups presenting the most variable complaints. The indians were called for a general health examination, and those who sought us in the first three days received care.

Umariçu II, which is a settlement of Ticuna indians is located in the surroundings of Tabatinga city, Amazonas, at the riverside of Solimões, in the borderline with Colombia and Peru, 1105 km away from Manaus, which is the capital city of the state, accessible by plane and boat. Ticuna indians have been living in peace with civilized men for about 300 years, counting on basic citizenship services in their settlements, such as natural person's registry services and healthcare facilities. The population of the settlement is constituted by 1,443 indians, all of them duly registered. Male indians are used to play soccer since childhood.

In this study, we included men and women with ages ranging from 10 to 65 years, as indicated by the ID document showed by the indians. The sample size was determined so as to enable the statistical analysis of the results found for genders and age groups of the study population.

**Study conducted at the Orthopaedics and Traumatology Service, Federal University of Amazonas – University Hospital Getúlio Vargas**

**Correspondences to: Rua Jose Furtuoso 3003, quadra E, casa 9, Condomínio House Ville – Bairro Nova Esperança – CEP 69037-580 Manaus – AM-Brasil - E-mail: [estewien@uol.com.br](mailto:estewien@uol.com.br)**

**1. Master in Orthopaedics and Traumatology, Medical Sciences School, Santa Casa de São Paulo**

**2. Orthopaedic Doctor**

**3. Associate Professor of the Medical Sciences School, Santa Casa de São Paulo, and Medicine Graduation Course Director, Santa Casa de Misericórdia de São Paulo**

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## Examinations performed

Any change noticed during ligament examination was regarded as a sign of ligament injury, according to the "International Knee Documentation Committee" - IKDC 2000<sup>(10)</sup> protocol. All residents were examined by the authors hereof at the healthcare facility of the settlement helped by communitarian health agents who master the indigenous language. Because the majority of the population cannot understand Portuguese, a subjective evaluation of the knees was impossible.

The physical examination protocol included the following items: Examination date, birth date, age, gender, alignment of lower limbs, range of motion, joint effusion, joint contractions and ligament tests, such as the Lachman's test, sudden stop point "End Point", anterior drawer, posterior drawer, stress in valgus, stress in varus, outward rotation test at 30 degrees, outward rotation test at 90 degrees, Pivot Shift test and reverse Pivot Shift test. The grading criteria of the IKDC 2000 were used: normal, close to normal, abnormal and very abnormal.

## STATISTICAL ANALYSIS

The Pearson's Chi-squared test was employed for checking the existence of any association between variables with a significance level of 5%<sup>(11)</sup>. The software employed for the analysis of data was the Epi-Info, version 6.04d<sup>(12)</sup>.

## RESULTS

In August 2003, 151 indigenous individuals were examined, 88 (58.3%) men and 63 (41.7%) women, representative of a populational sample of 10.5%. Table 1 shows that most of these individuals were 20-39 years old. The physical examination of the indigenous population showed that 12 (13.6%) men and 2 (3.2%) women presented with ACL injury (p value < 0.05). Twelve individuals had unilateral injuries, while 2 men presented bilateral injuries, resulting on a total of 16 knees with ACL injury.

Gender	Male			Female		
	N	n	%	N	n	%
Age Group						
10 - 19 years	9	1	11.1	6	0	0.0
20 - 29 years	27	3	11.1	20	1	5.0
30 - 39 years	24	4	16.7	14	0	0.0
40 - 49 years	16	3	18.8	12	0	0.0
50 - 59 years	12	1	8.3	11	1	9.1
Total	88	12	13.6	63	2	3.2

\* N : Number of examined patients ; n : Number of patients with ACL injury

**Table 1.** Distribution of the Ticuna indians' age groups by ACL injury

Most of the indigenous individuals (88%) showed varus knee: 84 (95.5%) men and 48 (77.4%) women (p-value < 0,05). Lachman's and the sudden stop "End Point" ligament tests showed that 13 (81.2%) of the 16 examined knees presented an abnormal or very abnormal results. This result was also noted for 12 (75%) knees on the anterior drawer test and in 10 (62.4%) knees upon the pivot shift test (Table 2). All ACL injuries were seen in individuals with varus alignment of the knees.

Ligament Examination	Normal		Close to Normal		Abnormal / Very Abnormal	
	n	%	n	%	n	%
Lachman	0	0	3	18.8	13	81.2
End Point	3	18.8	0	0	13	81.2
Anterior Drawer	0	0	4	25	12	75
Pivot Shift	3	18.8	3	18.8	11	62.4

\* n : Number of patients with ACL injury

**Table 2.** Distribution of the knees with ACL injury according to the grading criteria of the IKDC 2000.

## DISCUSSION

The natural evolution of ACL injuries is a very controversial matter. The occurrence of repeated sprains resulting from an anterior instability of the knee usually leads to meniscal and chondral injuries. The dissatisfaction of the individuals with their knees' performance motivates surgical treatment to recover stability<sup>(3-6)</sup>. However, there is no consensus about the number of patients that will show instability or future degenerative changes. For Noyes et al.<sup>(13)</sup> there was an improvement of the daily and recreational activities for one third of the patients, while Engebretsen et al.<sup>(14)</sup> found physical activity restraints in 93% of the studied patients. According to Rezende et al.<sup>(6)</sup>, the ACL injury reduces the performance of the individuals in physical activities, not allowing them to achieve the same levels as before trauma.

The Brazilian indigenous population usually lives far from urban cities, with a shortage of specialized healthcare. The reality of the state of Amazonas is worsened by the isolation of the region, where the access to indigenous communities must be made by plane or boat only. According to the culture of Ticuna indians, men are supposed to hunt, fish and protect the community, while women develop housekeeping activities, educate their children and take care of agriculture. In addition, men play soccer since childhood, which represents a highly demanding physical activity, placing the knee at a higher risk of sprains and predisposing the knee to endure ligament injuries.

In 2001, the incidence of sprains and knee ligament injuries among male and female soccer players of Manaus city's Main League, where it was noticed that the average time-off resulting from injuries was about 3.5 months for both genders, and among the players, the average time to return was almost 3 times longer in those experiencing ligament or meniscal injuries<sup>(15)</sup>. Luthje et al.<sup>(16)</sup> found that, among soccer players, knee injuries were the major cause for surgery, with a mean time to return to sports activities of 3 months. The importance of these knee injuries on athletes' time-off was demonstrated in both of these studies, unveiling the impact they have on these athletes' lives. We can extend this conclusion to the population of the present study, because they are individuals presenting a strong physical demand in their labor and sports activities.

The present study shows that 13.6% of male Ticunas experienced ACL injuries, a significantly higher percentage than that found for females (3.2%). In São Paulo, Carazzato et al.<sup>(17)</sup> found 37 meniscal and ligament injuries of the knee in 281 medical care provided to soccer players, especially in athletes in the age group of 15-25 years., resulting in a rate of 13.2%. This rate is very close to the one found in the present study for male Ticunas. We didn't find in none of the examined knees an association of the ACL injury with other ligament injuries. Only one female Ticuna showed an abnormal posterior drawer on the contralateral knee.

The physical examination of the knees among the indigenous individuals with ACL injuries showed that 81.2% presented an abnormal or very abnormal grade, according to the criteria described on the IKDC 2000 (Table 2). This result indicates that most of them showed a serious knee dysfunction. We did not use any subjective method for ascertaining the indigenous individuals' perceptions about their knees, due to verbal communication challenges. However, we believe that a subjective system of knee evaluation would point out to dissatisfaction due to the severity of the changes found in the examination.

Concerning knee alignment, we found that most of them showed the varus pattern (88%). According to Fu and Stone<sup>(18)</sup>, The alignment pattern of the knees tends to be varus in men and physiologically valgus in women. In our study, all cases with ACL injury showed genuvarus. According to Noyes et al.<sup>(19)</sup>, knees' position in varus predisposes ACL injury sufferers to evolve to instability. In addition, our patients showed 3 additional decisive factors for evolution to knee anterior instability: patient age, degree of tibial shift and number of hours practicing high-to-moderate demanding physical activity<sup>(20)</sup>. Based on these data, Daniel et al<sup>(20)</sup>, developed a scale of risk of a knee with ACL injury evolving to surgical treatment, considering a high risk to surgery in those patients presenting tibial shift above 7 mm and over 200 hours of sports practice. We also

noticed that most of the indigenous population was 30-39 and 40-49 years old, and that 81.2% showed a tibial shift above 6 mm ("abnormal" or "very abnormal") upon Lachman and End Point tests (Table 2).

This allows us to suppose that most of the individuals with ACL injury presented an indication to surgical treatment. However, for living in isolation from urban centers, they will be subjected to the natural evolution of the disease, with progressive knee function loss, a fact that will restrain their sports and labor-related activities.

## CONCLUSION

The results presented and discussed in the present study enables us to draw the following conclusions:

- 1) The Male indigenous population shows a significantly higher incidence of ACL injury than the female one, probably due to soccer playing;
- 2) Genuvarus was the prevalent biotype among the male and female indigenous population of the study;
- 3) The indigenous individuals with ACL injury tend to evolve to anterior knee instability due to the alignment in varus, to the strong tibial shift and to the practice of highly physically demanding activity, i.e. soccer.

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