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ORIGINAL

Incidence of primary patellar dislocation in Colombia

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KEYWORDS
Patellofemoral Joint;
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Abstract
Introduction and objectives: Primary acute patellar dislocations (PAPD) account for 3% of all traumatic knee lesions, and several studies have estimated the general incidence of patellar dislocation to be between 2 and 77.4 per 100,000 person-years. Few studies have evaluated the incidence of primary lateral patellar dislocation in Latin America. The aim of the study was to evaluate the incidence of patellar dislocation in patients from a reference center in the Colombian southwest, report trends in the incidence of dislocation, and describe the rate of surgical treatment.
Materials and methods: We performed an observational, analytical, cross-sectional study including all patients older than 9 years old with primary lateral patellar dislocation (PLPD), between January 2011 and June 2018, in a tertiary care center in Latin America.
Results: In our population, the incidence of primary lateral patellar dislocation (PLPD) was 32.38 per 100,000 person-years. The age group between 14 and 18 years old had the highest incidence (187.74 per 100.000). In the 10 to 13-year-old group, females had a significantly higher incidence (179.05 vs 59.85 /100,000, p-value < 0.001).
Conclusions: With an incidence of 32.38 per 100,000 person- years, primary patellar dislocation is a frequent orthopaedic injury in our population. The peak incidence by age group was in adolescents between 14 to 18 years old.

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PALABRAS CLAVE
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Incidencia

Incidencia de luxación primaria de patela en Colombia

Resumen
Introducción y objetivos: La luxación aguda primaria de patela representa el 3% de las lesiones traumáticas de la rodilla. Diferentes estudios han estimado la incidencia de luxación de patela entre 2 y 77.4 por 100,000 personas año. Hay pocos estudios en Latinoamérica. El objetivo de este estudio es calcular la incidencia de luxación patelofemoral en un centro de referencia en el suroccidente de Colombia, evaluar la tendencia en los últimos años y describir la tasa de manejo quirúrgico.
Materiales y métodos: Estudio observacional analítico tipo corte transversal que incluyó todos los pacientes mayores de 9 años con luxación primaria lateral de patela entre enero de 2011 y junio de 2018, en un hospital de atención avanzada en Colombia.
Resultados: En esta población, la incidencia de luxación lateral patelofemoral fue de 32.38 por 100,000 personas-año. El grupo de edad entre 14-18 años tuvo la mayor incidencia (187.74 por 100.000). Solo en el grupo entre 10-13 años, el sexo femenino tuvo una incidencia significativamente mayor que los hombres (179.05 vs 59.85 por 100,000, $p < 0.001$).
Conclusiones: Con incidencia de 32.38 por 100,000 personas-año, la luxación patelofemoral es una patología ortopédica frecuente en nuestra población. El pico de incidencia es entre 14-18 años.

Introduction

Patellar dislocation is defined as a non-recurring or recurrent loss of the relationship between the patella and the trochlear groove of the femur.[1] Usually, the patella dislocates in a lateral direction, representing 2-3% of all knee injuries.[1,2] Primary acute patellar dislocations are the first cause of traumatic hemarthrosis of the knee in children and the second in adults after anterior cruciate ligament tears.[3–5] It occurs most commonly in the second decade of life and is more common in females.[2]

The reported incidence of patellar dislocation is highly variable. Previous studies have estimated the general incidence of patellar dislocation to be between 2–77.4 per 100,000.[6–11] For instance, Waterman et al. reported an incidence of 2.29 per 100,000,[12] while there are reports in the United States military of 77,4 per 100,000.[3] Furthermore, it has been shown that patients in the second decade of life (10 to 19 years), particularly those aged 15 to 19 years, have the highest risk of injury.[12] Previous studies have shown that the incidence in the < 20 years age group was 29 to 107 per 100,000,[3,7,10] falling to 9 per 100,000 in the third decade.[2,13]

The differences in reported incidences are probably secondary to the selected cohorts, the period of time, and the study design. These differences were the motivation to carry out our study, which aims to evaluate the incidence of patellar dislocation in patients from a reference center in the Colombian southwest, report trends in the incidence of dislocation, and describe the rate of surgical treatment.

Methods

Context: This study was conducted at Fundación Valle del Lili (FVL), a university hospital in Cali, Colombia. FVL is a tertiary health center in Southwest Colombia with specialists trained for the care of patients with complex orthopedic injuries, making this institution an orthopedic referral center.

Ethical considerations. The Biomedical Research Ethics Committee from Fundación Valle del Lili approved the study (IRB No. 1183). Following the ethical principles of medical research described in the Declaration of Helsinki and considering the regulations of Resolution 8430/1993 of the Ministry of Health and Social Protection of Colombia.

Type of study and population: An observational, analytical, cross-sectional study was conducted, including all patients older than 9 years old who sustained primary lateral patellar dislocation (LPD). The study period was from January 2011 to June 2018. There were no exclusion criteria.

Assessment: All patients were evaluated by an orthopedic sports medicine surgeon. The evaluation included questions about their first episode and further dislocations, type of treatment received and physical examination.

Data collection and processing: Data was retrospectively collected from electronic medical records, including demographic and clinical characteristics. This information was recorded in an electronic database used exclusively by FVL.

Statistical analysis: Age- and sex-specific rates of patellar dislocation were calculated by using the number of first-time lateral patellar dislocations (incident cases) as the numerator and population estimates based on FVL census as the denominator, with linear interpolation between census years. Only patients who consulted FVL at the time of patellar dislocation and who fulfilled the study criteria were included in the incidence calculations. Overall incidence rates were age and sex-adjusted to the 2011 to 2018 population of Fundación Valle del Lili, Cali, Colombia.

Table 1 Patellar dislocation recurrence with different cut points.

Age	n	Without dislocation recurrence	With dislocation recurrence
≥ 15	101	58 (57.43%)	43 (42.57%)
≥ 16	85	50 (58.82%)	35 (41.18%)
≥ 17	61	40 (65.57%)	21(34.43%)
≥ 18	53	38 (71.70%)	15(28.30%)
≥ 19	48	36 (75.00%)	12(25.00%)
≥ 20	43	33 (76.74%)	10(23.26%)
≥ 21	40	32 (80.00%)	8(20.00%)

Table 2 Incidence rate for patellar dislocation by age group and sex.

Number of cases by sex				Incidence rate (per 100,000 person-year)			
Age group	Female cases	Male cases	Total cases	Female	Male	Total	*P* Value
10-13	27	10	37	179.05	59.85	116.40	< 0.001
14-18	32	34	66	189.75	185.88	187.74	0.84
19-25	11	12	23	40.04	49.22	44.36	0.33
26-35	5	5	10	9.45	12.16	10.64	0.56
36-45	4	6	10	7.71	15.65	11.09	0.1
46-65	4	1	5	4.19	1.46	3.06	0.27
Total	83	68	151	31.99	32.87	32.38	0.91

95% confidence interval (95% CI) for the incidence rates were constructed using the assumption that the number of incident cases per year followed a Poisson distribution. Incidence trends were examined using Poisson regression models, with smoothing splines for age and calendar year. All analyses were performed using STATA 14 statistical software.

Results

The cohort includes 466,292 patients, of which 151 had a primary lateral patellar dislocation diagnosis. Of the 151 cases, 83 were female (54,97%), 66 of the cases (43.70%) were in the age group between 14 and 18 years old, and 97 cases (64.24%) presented trochlear dysplasia (Type A 47, type B 18, type C 19 y type D 12

Of the 151 patients diagnosed with primary patellar dislocation from 2011 to 2018, 34 (22.5%) underwent surgery. Return to sport was possible for 23 of the total subjects (15.23%). 80 patients (52.98%) experienced a recurrence of patellar dislocation during the study period. Table 1, shows the recurrence of patellar dislocation by age group.

The global incidence of primary lateral patellar dislocation was 32.38 per 100,000 person-years. The highest incidence of patellar dislocation by age group was found between 14 and 18 years-old: 187.74 per 100,000 person-years. When performing the Wilcoxon test, there was no evidence of a difference in incidence between females and males for this age group ($p = 0.84$). However, in the 10 to 13-year-old group, females had a significantly higher incidence (179.05 vs. 59.85/100,000 person-years, $p < 0.001$). Table 2, shows the incidence of LPD by age group and sex.

During the study period there was a significant decrease in the incidence of LPD in females aged 14-18 years between 2011-2014 and 2015-2018. The descent showed a change from 134.95 to 47.06 per 100,000 person-years. Other changes across the study period between groups are shown in Table 3 and Figure 1.

Discussion

The overall incidence of primary patellar dislocation in this study was 32.38 per 100,000 person-years, which is similar to that has been reported by Sanders TL et al. (23.2/100,000),[8] Gravesen et al. (42/100.000),[13] and Nietosvaara et al. (43/100,000).[10] Though, there are studies that show even higher incidences such as the retrospective series in the US military population (77/100,000) [3]and the study from Sillanpää et al. in Finnish male conscripts (77.4/100.000).[14] These differences may reflect less physical activity by the civilian population than in the military, which is a previously evidenced risk factor for this pathology.[15]

This study shows that the age group with the highest incidence for primary patellar dislocation is between 14 to 18 years old, with an incidence of 187.74 per 100,000 person-years. These data are in agreement with the findings found in the literature, such as the case of the investigation carried out in the population of Olmsted County, Minnesota, which reported an incidence in the same age group of 147.7 per 100,000 person-years,[8] the prospective study carried out by Nietosvaara et al. which reported an incidence of 107 per 100,000 person-years in ages between 9 and 15 [10]and Gravesen et. al (108/100,000) in a population of women aged 10 to 17 years.[13] Conversely, there also results from other publications that show a lower incidence, such as Atkin DM et al. (31/100.000) between 10 and 19 years [6]and Fithian et al. (29/100.000).[7] The higher incidence observed in adolescents could be explained by the rapid bone growth (skeleton), change in angle Q with growth, increased level

Table 3 Trends in patellar dislocation from 2011 to 2018 by sex.

Age and Sex	2011-2014			2015-2018			P Value
	Cases	n	Incidence rate	Cases	n	Incidence rate	
Female							
10-13 years	11	13250	83,02	16	17153	93,28	0.44
14-18 years	22	16302	134,95	10	21249	47,06	< 0.01
19-25 years	5	26820	18,64	6	37171	16,14	0.67
26-35 years	3	46024	6,52	2	60354	3,31	0.31
36-45 years	1	44657	2,24	3	53714	5,59	0.24
46-65 years	2	98028	2,04	2	117407	1,70	0.86
Total	44	245081	17,95	39	307048	12,70	0.34
Male							
10-13 years	5	14371	34,79	5	18881	26,48	0.29
14-18 years	16	14788	108,20	18	18640	96,57	0.41
19-25 years	5	21352	23,42	7	26781	26,14	0.69
26-35 years	1	31083	3,22	4	36450	10,97	0.05
36-45 years	3	30697	9,77	2	34957	5,72	0.30
46-65 years	0	63202	0,00	2	73491	2,72	0.99
Total	30	175493	17,09	38	209200	18,16	0.85
Total	74	420574	17,60	77	516248	14,92	0.63

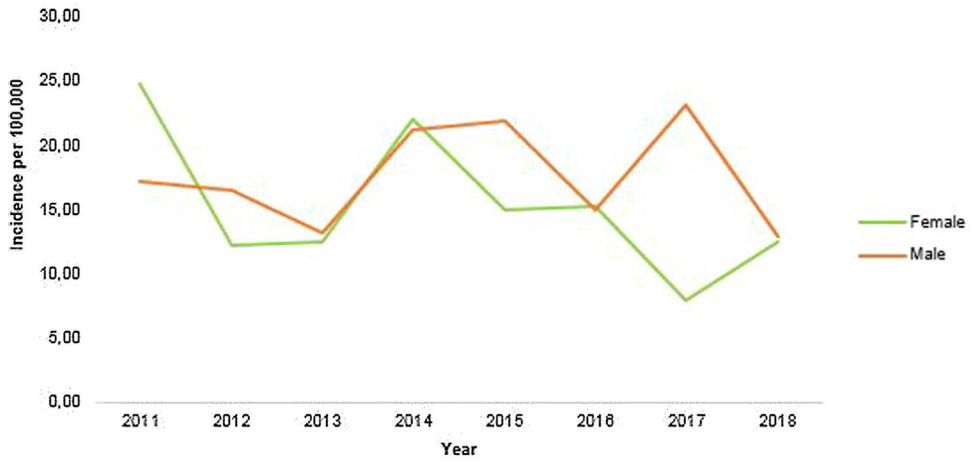

Figure 1 Relationship between primary patellar dislocation incidence, year and sex.

of physical activity and laxity of the ligaments, which are the factors that could contribute to this occurrence.[16]

Regarding the incidence of primary patellar dislocation concerning gender, literature has suggested that it is significantly higher in women. Hsiao et al. reported an adjusted incidence of 0.63/1000 in females compared to 0.39/1000 in males.[3] In the results from our study, there were no differences between gender for the overall incidence and for most of the age groups. The only group where there was difference between sexes was for the 10-13 years old group, with a higher incidence for girls compared to boys. This could be explained on the fact that girls get to their adolescence growing peek at a younger age than boys.

It was observed that in the group of females between the ages of 14 and 18, there was a significant decrease in the incidence between the periods 2011-2014 and 2015-2018, with an initial incidence of 134.95 per 100,000 and final of 47.06 per 100,000 respectively (p-value < 0.001). This phenomenon is similar to what Sanders TL et al. described in this same group with a P value = 0.025.[8] However, it is not clear why this phenomenon might have occurred.

Limitations: The main limitation of this study is the retrospective design which makes it more prone to bias. The calculated incidence rates only show those cases that were formally diagnosed by a physician from our institution and therefore did not include those patients who dislocated and did not consult or those who were not correctly diagnosed. To control this selection bias, all patients found in the database during the study period were eligible, and we actively reached them by contacting them via phone calls and email to schedule a follow-up appointment. Finally, the risk of selection bias was also reduced because the study was carried out in a high volume national medical reference center that offers healthcare to a wide range of patients. The

fact of having a physician evaluating every case, decreases the risk of overestimation.

Implications moving forward: The findings of this study will drive further efforts and research to identify high-risk populations and modifiable risk factors for patellar dislocation. This information will promote the creation of preventive initiatives to reduce primary dislocation and recurrence and avoid long-term complications that increase patient morbidity and entail increased costs for the health system. Understanding the burden that patellar dislocation has in society can improve awareness and efforts to improve its treatment.

Conclusions

With an incidence of 32.38 per 100,000 person- years, primary patellar dislocation is a frequent orthopedic injury in our population. The peak incidence by age group was in adolescents between 14 to 18 years old.

Author contributions

Conceptualization: J.P.M.-C., J.C.; Data curation: J.C., J.P.M.-C.; Formal analysis: J.C., J.P.M.-C., J.F.L.; Funding acquisition: J.P.M.-C.; Methodology: J.C., J.P.M.-C., J.F.L., J.J.M.A.; Supervision: J.P.M.-C.; Validation: J.C.; Roles/Writing - original draft: J.C., J.P.M.-C., J.F.L., J.J.M.A.; Writing - review & editing: J.C., J.P.M.-C., J.F.L., J.J.M.A.

Declaration of interest

None.

Conflicts of interest

None.

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