

# Xanthogranulomatous pyelonephritis: a current challenge for laparoscopy

## *Pielonefritis xantogranulomatosa: un reto actual para la laparoscopia*

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### Abstract

**Objective:** To present the results of our case series on laparoscopic nephrectomy in xanthogranulomatous pyelonephritis (XGP). **Methods:** A retrospective study was conducted that included 143 patients treated with laparoscopic nephrectomy for non-functioning kidney, of whom 15 had XGP, within the time frame of 2011 to 2019. The demographic and clinical data were collected, along with the intraoperative results, complications, and days of hospital stay. **Results:** Transperitoneal laparoscopic nephrectomy was successfully performed on 15 patients with XGP, with no need for conversion. Mean intraoperative time was 124.4 minutes (range 70-240) and intraoperative blood loss was 148.5 mL (range 30-550), with no blood transfusion required. No intraoperative complications occurred but there was one postoperative complication (6.6%), classified as Clavien-Dindo I (surgical wound infection). Mean hospital stay was 2.85 days (range 2-7). **Conclusions:** Nephrectomy is the definitive management for XGP, and the laparoscopic approach should be considered a treatment modality, despite the fact that the pathology involves a severe chronic inflammatory process. Its benefits are reduced surgery duration, less blood loss, a lower complication rate, and fewer days of hospital stay, when performed by a skilled and experienced surgeon.

**Keywords:** Laparoscopy. Pyelonephritis, Xanthogranulomatous. Nephrectomy.

### Resumen

**Objetivo:** Presentar los resultados de nuestra serie de nefrectomía laparoscópica en pielonefritis xantogranulomatosa (XGP). **Método:** Se realizó un estudio retrospectivo que incluyó 143 pacientes tratados con nefrectomía laparoscópica por exclusión renal, de los cuales 15 fueron por XGP, en el periodo comprendido de 2011 a 2019. Se recolectaron datos demográficos y clínicos, resultados transoperatorios, complicaciones y días de estancia hospitalaria. **Resultados:** Se realizó nefrectomía laparoscópica transperitoneal de forma exitosa en 15 pacientes con XGP, sin necesidad de conversión. El tiempo transoperatorio promedio fue de 124.4 minutos (rango: 70-240). El sangrado transoperatorio fue de 148.5 mL (rango: 30-550), sin requerimiento de transfusión sanguínea. No se reportaron complicaciones transoperatorias; se presentó una complicación en el posoperatorio (6.6%) clasificada como Clavien-Dindo I (infección de la herida quirúrgica). La estancia hospitalaria promedio fue de 2.85 días (rango: 2-7). **Conclusiones:** El manejo definitivo de la XGP es la nefrectomía, y el abordaje laparoscópico debe ser considerado como una modalidad de tratamiento a pesar de ser una patología que presenta un proceso inflamatorio

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Date of reception: 01-02-2022

Date of acceptance: 04-05-2022

DOI: 10.24875/CIRUE.M22000527

Cir Cir (Eng). 2023;91(3):328-332

Contents available at PubMed

[www.cirugiaycirujanos.com](http://www.cirugiaycirujanos.com)

*grave y crónico, obteniéndose beneficios como disminución en el tiempo quirúrgico, menor sangrado, menor tasa de complicaciones y menos días de estancia hospitalaria cuando es realizado por un cirujano experimentado.*

**Palabras clave:** Laparoscopia. Pielonefritis xantogranulomatosa. Nefrectomía.

## Introduction

Xanthogranulomatous pyelonephritis (XGP) is a rare and serious chronic inflammatory condition characterized by the destruction of renal parenchyma and chronic infiltration of lipid-laden macrophages that can involve adjacent structures<sup>1</sup>. It represents approximately 1% of all cases of chronic pyelonephritis reported, with values ranging from 0.6% to 1.4%. It was first described back in 1916 by Schlagenhauser, and later in 1944, Osterlin coined the term “xanthogranuloma” to describe the lipid-laden macrophages inside (foamy histiocytes)<sup>2</sup>.

XGP is more commonly seen in women, with a man-to-woman ratio of 1:3, and it predominantly affects adults between the fifth and seventh decades of life. The condition is typically unilateral, but it can also be of a bilateral nature<sup>2,3</sup>.

While its etiology remains unknown, three factors have been observed in over 80% of the cases: infection, obstruction, and lithiasis. In cases of lithiasis, approximately 50% are of the staghorn type. Infections are often caused by enterobacteria, with *Proteus mirabilis* and *Escherichia coli* being the predominant culprits. Other bacteria, including *Klebsiella sp.*, *Staphylococcus aureus*, *Enterococcus sp.*, *Pseudomonas sp.*, and *Streptococcus sp.*, have also been identified<sup>3,4</sup>.

The clinical presentation of XGP is nonspecific and variable, characterized by fever, chills, anorexia, weight loss, malnutrition, palpable mass, flank pain, hematuria, and pyuria, which can lead to misdiagnosis as malignant neoplasms<sup>2-6</sup>.

Preoperative diagnosis can be challenging, even with imaging modalities, and can often be inaccurate. Currently, computed tomography is the preferred diagnostic tool as it allows for the assessment of renal unit involvement and the degree of the inflammatory process involving peri-, para-, or extrarenal structures. Malek et al. described 3 stages of involvement: Stage I, limited to the renal capsule; stage II, confined to Gerota's fascia; and stage III, extending beyond Gerota's fascia<sup>1,5,6</sup>.

The definitive treatment for XGP is nephrectomy, and traditionally, open surgery was the treatment of choice<sup>7</sup>. Since the introduction of laparoscopy, laparoscopic nephrectomy has been widely accepted and considered a treatment modality for various conditions. With increasing

experience in this procedure, laparoscopic nephrectomy has been used in cases of XGP. While it is considered a reasonable treatment option, it is technically more challenging than laparoscopic nephrectomy to treat non-infectious disease and should be performed by a surgeon with extensive experience<sup>8-11</sup>.

## Method

This was a retrospective and descriptive study conducted with patients who underwent transperitoneal laparoscopic nephrectomy with a preoperative diagnosis of renal with histopathological confirmation of XGP. Fifteen cases were reviewed from 2011 through 2019, all performed at the Urology Department of Hospital General de México Dr. Eduardo Liceaga, Mexico City, Mexico. Patients with histopathological reports different from the diagnosis under study were excluded. Several variables were analyzed, including gender, age, weight, height, body mass index (BMI), affected side, surgical time, intraoperative bleeding, complications, length of stay, concomitant diseases (systemic hypertension, type 2 diabetes mellitus, Parkinson's disease, ascites), previous urological procedures (extracorporeal lithotripsy, nephrostomy placement, double J ureteral catheter placement), Malek classification, and the presence of lithiasis.

## Results

From 2011 through 2019, a total of 143 laparoscopic nephrectomies were performed for a diagnosis of renal exclusion, with only 15 cases (10.4%) being confirmed as XGP through histopathology examination. Among the analyzed variables, female gender predominated (93.3%), with a mean age of 54.5 years (range, 38-78). The mean weight was 67.4 kg (range, 52-88); the mean BMI, 27.9 kg/m<sup>2</sup> (overweight) (range, 21.6-36.1); and the mean height, 1.53 m (range, 1.46-1.62). Concomitant diseases were present in 5 patients (2 with systemic hypertension, 2 with type 2 diabetes mellitus, 1 with Parkinson's disease, 1 with hyperuricemia, and 1 with ascites) at the time of surgical intervention. Only 5 patients had undergone previous urological procedures, such as extracorporeal

lithotripsy, nephrostomy, or double J ureteral catheter placement. The left side was the one most widely damaged (66.6% of the cases). According to Malek's classification, 46.7% fell into Malek type I, 33.3% into Malek type II, and 20% into Malek type III. Lithiasis was identified in 80% of the cases, being 75% of the cases (9 patients) found at renal level and 25% at ureteral level (Table 1).

Regarding perioperative results, laparoscopic nephrectomy was successfully performed in all 15 patients diagnosed with XGP without the need for conversion to open surgery. The mean intraoperative time was 124.4 min (range, 70-240). The intraoperative bleeding reported was 148.5 mL (range, 30-550), and none of the patients required blood transfusion. There were no reported intraoperative complications. One postoperative complication categorized as Clavien-Dindo I (surgical wound infection) occurred, resulting in a complication rate of 6.6%. The mean length of hospital stay was 2.85 days (range, 2-7) (Table 2).

## Discussion

XGP is a well-known condition, and although its incidence rate is very low, it has been extensively described for many years. Similar to what has been reported by the medical literature available, women were predominant in our series, with a higher ratio than reported in other series<sup>2</sup>. The age of presentation corresponds to the age group between the fifth and seventh decades of life<sup>2,3</sup>. Our patients had an overweight BMI, with a mean of 27.9 kg/m<sup>2</sup> (range, 21.6-36.1). The heaviest patient weighed 36.1 kg/m<sup>2</sup> and none were underweight<sup>4,5</sup>. Renal involvement was unilateral in all cases (no bilateral cases were observed), and the left side was more commonly affected (66.6% of the cases), contrary to other series that report the right side as the most widely damaged one.

Regarding Malek's classification, grade I was predominant in our series (46.7%), followed by grade II in 33.3% of the cases<sup>4</sup>. The prevalence of associated renal lithiasis was 80%, which is consistent with the descriptions made in other series<sup>8</sup>.

In our series, the surgical time was shorter compared to other studies (124.4 min). Bercowsky et al.<sup>10</sup> reported a mean time of 360 min. However, it was the first laparoscopic nephrectomy series for XGP. In a more recent study, Lima et al.<sup>12</sup> achieved a surgical time similar to ours (122.5 min) in the group of patients who did not require conversion to open surgery. Recent series have reported shorter surgical times<sup>13</sup>.

**Table 1. Patients' characteristics**

|                             |                    |
|-----------------------------|--------------------|
| Sex                         |                    |
| Woman                       | 14 (93.3%)         |
| Man                         | 1 (6.6%)           |
| Age                         | 54.5 years (38-78) |
| Weight                      | 67.4 kg (52-88)    |
| Height                      | 1.53 m (1.46-1.62) |
| Body mass index             | 27.9 (21.6-36.1)   |
| Side damaged                |                    |
| Left                        | 10 (66.6%)         |
| Right                       | 5 (33.3%)          |
| Comorbidities               | 5 (33.3%)          |
| Previous urologic procedure | 5 (33.3%)          |
| Malek's classification      |                    |
| I                           | 7 (46.7%)          |
| II                          | 5 (33.3%)          |
| III                         | 3 (20%)            |
| Presence of lithiasis       | 12 (80%)           |

BMI: body mass index.

**Table 2. Perioperative results**

| Variable                | Mean               |
|-------------------------|--------------------|
| Surgical time           | 124.4 min (70-240) |
| Intraoperative bleeding | 148.5 mL (30-550)  |
| Complications           | 6.6%               |
| Length of stay          | 2.85 days (2-7)    |

Intraoperative bleeding in our patients was less than that the one described in most laparoscopic nephrectomy studies for XGP, and none of our patients required transfusion. In their study of 17 patients Shah et al.<sup>14</sup> reported the lowest intraoperative bleeding to date at 141.1 mL, which is very close to the bleeding seen in our case series.

Additionally, although a high number of complications have been reported in the medical literature available, such as surgical wound infection, organ or hollow viscus injury, septic shock, and death, our series had a complication rate of 6.6%, which is lower than the rates reported in other studies (up to 60%)<sup>10</sup>. Recent series report complication rates of up to 22.2%<sup>15</sup>.

Conversion rates to open surgery are very high, reaching up to 33.3%. However, there is a trend toward a decrease, with some studies reporting rates as low as 3.7%<sup>15,16</sup>. Rosoff et al.<sup>9</sup> did not report any conversions

**Table 3. Results of case series of laparoscopic nephrectomy in xanthogranulomatous pyelonephritis**

| Study                                   | Patients (n) | Age (years) | Surgical time (min) | Intraoperative bleeding (ml) | Complications (%) | Transfusion (%) | Conversion rate (%)                        | Length of stay (days) |
|-----------------------------------------|--------------|-------------|---------------------|------------------------------|-------------------|-----------------|--------------------------------------------|-----------------------|
| Bercowsky et al. (1999) <sup>10</sup>   | 5            | 72.4        | 360                 | 260                          | 60                | 20              | 20                                         | 6                     |
| Khaira et al. (2005) <sup>16</sup>      | 3            | 42.5        | 279                 | 1117                         | 33                | 33              | 33.3                                       | 4.7                   |
| Rosoff et al. (2006) <sup>9</sup>       | 11           | 51          | 157                 | 217                          | 36.3              | -               | 0 (36.3)                                   | 2.4                   |
| Kapoor et al. (2006) <sup>11</sup>      | 10           | 37.1        | 228                 | 383                          | 30                | -               | 20                                         | 3.8                   |
| Vanderbrink et al. (2007) <sup>18</sup> | 6            | 54          | 301                 | 775                          | 50                | 50              | 16.6                                       | 4.8                   |
| Guzzo et al. (2009) <sup>7</sup>        | 14           | 49          | 228                 | 300                          | 42.8              | 21              | 7                                          | 3                     |
| Arvind et al. (2011) <sup>13</sup>      | 19           | 37.5        | 284                 | 220                          | 42.1              | 5.2             | 26.3                                       | 4.4                   |
| Shah et al. (2011) <sup>14</sup>        | 17           | 39.5        | 176.5               | 141.1                        | 35.29             | -               | 5.8                                        | 9.7                   |
| Campanario et al. (2018) <sup>17</sup>  | 17           | 60          | 198                 | -                            | 11.8              | -               | 20 (intraoperative),<br>40 (postoperative) | 12.5                  |
| Asali y Tsivian (2019) <sup>15</sup>    | 27           | 61.1        | 193.6               | 223.5                        | 22.2              | 29.6            | 3.7                                        | 4.8                   |
| Rosas-Nava et al. (2021)                | 15           | 54.5        | 124.4               | 148.5                        | 6.6               | 0               | 0                                          | 2.85                  |

to open surgery, but 36.3% of the cases required conversion to hand-assisted laparoscopic nephrectomy. In our series, all procedures were completed without the need for conversion to open surgery.

Finally, there is evidence of a decrease in hospital stay compared to patients treated with an open approach<sup>7</sup>. In Lima et al.'s<sup>12</sup> series, patients treated with laparoscopic nephrectomy who did not require conversion to open surgery had lengths of stay of 2.1 days. The results obtained in our series show lengths of stay of 2.85 days, which is very similar to the current global literature available.

Table 3 shows the results of the main series of laparoscopic nephrectomy in patients with XGP<sup>7,9-11,13-18</sup>. Overall, surgical times are shorter, as well as complication and conversion rates. Intraoperative bleeding and the length of stay are also lower compared to open approaches.

## Conclusions

The definitive management of XGP is nephrectomy. Traditionally, open surgery was the treatment of choice, but currently, laparoscopic nephrectomy has been widely accepted and considered a treatment modality for cases of XGP. Despite being a condition with severe chronic inflammatory processes, it benefits from the laparoscopic approach, demonstrating shorter surgical times, fewer hemorrhages, lower rates of complications, and shorter lengths of stay. However, performing this type of approach requires the skills and experience to do so.

## Funding

None declared.

## Conflicts of interest

None declared.

## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that they have followed the protocols of their work center on the publication of patient data.

**Right to privacy and informed consent.** The authors have obtained approval from the Ethics Committee for analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

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