



# Postoperative lymph node division and its effect on lymph node count and staging in patients with gastric cancer

División ganglionar posquirúrgica y su efecto en el recuento ganglionar y la estadificación en pacientes con cáncer gástrico

Bernardo A. Borrález-Segura, MD<sup>1,2</sup> , Felipe Anduquia-Garay<sup>3</sup> ,  
Valentina Santa-Gil, MD<sup>1</sup> , Mario Erazo-Eraso, MD<sup>1</sup> , Juliana Gómez-Raigosa, MD<sup>2</sup> ,  
Giovanni García, MD<sup>3</sup> , Paydieg Nathalia Márquez-Parra<sup>3</sup> , Yesica Cardona<sup>3</sup> ,  
Juanita Santa-Gil<sup>3</sup> , Natalia Ochoa<sup>3</sup> 

<sup>1</sup> Gastrointestinal Surgery and Endoscopy Service, Risaralda section of the Liga Contra el Cáncer, Pereira, Colombia.

<sup>2</sup> Department of Gastrointestinal Surgery, Clínica Comfamiliar, Pereira, Colombia.

<sup>3</sup> School of Clinical Sciences, Universidad Tecnológica de Pereira, Pereira, Colombia.

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## Abstract

**Introduction.** A gastrectomy and lymph node dissection is the standard of management for patients with gastric cancer. Factors such as the identification of nodes by the pathologist can have a negative impact on staging and treatment. The objective of this study was to compare the lymph node count of a surgical specimen after a complete gastrectomy (group A) and of a specimen with lymph node by groups (group B).

**Methods.** Study of a retrospective database of patients undergoing D2 gastrectomy in the Risaralda section of the Liga Contra el Cáncer Gastrointestinal surgical service, Pereira, Colombia. The lymph node count was compared in surgical specimens with and without lymph node division by anatomical regions, prior to sending them to pathology.

**Results.** Of the 94 patients who underwent surgery, 65 were from group A and 29 patients were from group B. The average number of nodes was  $24.4 \pm 8.6$  and  $32.4 \pm 14.4$ , respectively ( $p=0.004$ ). The percentage of patients with more than 15 and 25 nodes was lower in group A than in group B (27 vs 57,  $p=0.432$  and 19 vs 24,  $p=0.014$ ). The average number of patients with a nodal ratio less than 0.2 was higher in group B (72.4% vs 55.4%,  $p=0.119$ ).

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Corresponding author: Bernardo A. Borrález-Segura, Carrera 15 # 1 - 55 Casa 10, Pereira, Colombia. Tel.: +57 310 2570492

Email: bborraez@hotmail.com; b.borraez@utp.edu.co

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**Conclusions.** The results of our study showed that a division by lymph node groups prior to the evaluation of the specimen by the pathology service increases the lymph node count and allows the prognosis of patients to be accurately established, having a positive impact on their staging, to avoid overtreatment.

**Keywords:** stomach neoplasms; gastrectomy; lymph nodes; lymphatic metastasis; lymph node excision; neoplasm staging.

## Resumen

**Introducción.** La gastrectomía y disección ganglionar es el estándar de manejo para los pacientes con cáncer gástrico. Factores como la identificación de ganglios por el patólogo, pueden tener un impacto negativo en la estadificación y el tratamiento. El objetivo de este estudio fue comparar el recuento ganglionar de un espécimen quirúrgico después de una gastrectomía completa (grupo A) y de un espécimen con un fraccionamiento por grupos ganglionares (grupo B).

**Métodos.** Estudio de una base de datos retrospectiva de pacientes sometidos a gastrectomía D2 en el Servicio de Cirugía gastrointestinal de la Liga Contra el Cáncer seccional Risaralda, Pereira, Colombia. Se comparó el recuento ganglionar en especímenes quirúrgicos con y sin división ganglionar por regiones anatómicas previo a su envío a patología.

**Resultados.** De los 94 pacientes intervenidos, 65 pertenecían al grupo A y 29 pacientes al grupo B. El promedio de ganglios fue de  $24,4 \pm 8,6$  y  $32,4 \pm 14,4$ , respectivamente ( $p=0,004$ ). El porcentaje de pacientes con más de 15 y de 25 ganglios fue menor en el grupo A que en el grupo B (27 vs 57,  $p=0,432$  y 19 vs 24,  $p=0,014$ ). El promedio de pacientes con una relación ganglionar menor 0,2 fue mayor en el grupo B (72,4 % vs 55,4 %,  $p=0,119$ ).

**Conclusiones.** Los resultados de nuestro estudio mostraron que una división por grupos ganglionares previo a la valoración del espécimen por el servicio de patología incrementa el recuento ganglionar y permite establecer de manera certera el pronóstico de los pacientes, teniendo un impacto positivo en su estadificación, para evitar el sobretratamiento.

**Palabras clave:** neoplasias gástricas; gastrectomía; ganglios linfáticos; metástasis linfática; escisión del ganglio linfático; estadificación de neoplasias.

## Introduction

Gastric cancer is the leading cause of death from cancer in Colombia and ranks third in incidence among neoplastic diseases, but a minimal number of patients are diagnosed in early stages<sup>1-3</sup>. Gastrectomy with adequate lymphadenectomy is the mainstay of treatment and is related to a better prognosis, being an indicator of recurrence and survival. Guidelines recommend more than 15 nodes for adequate staging<sup>4,5</sup>.

Although the lymph node count is influenced by multiple factors, such as the surgeon's training and experience, tumor location, and the use of neoadjuvant therapy, the number of involved lymph nodes can also be altered by factors unre-

lated to the treatment, such as the identification of lymph nodes by the pathologist, which can have a negative impact on staging and, in some cases, treatment<sup>6,7</sup>. The objective of this study was to compare the lymph node count reported by the pathology service in surgical specimens without complete alteration (group A) and in specimens with a lymph node division by anatomical regions (group B).

## Methods

Prospective review study of a retrospective database of patients undergoing total or subtotal gastrectomy as needed, with D2 lymph node dissection, for the treatment of adenocarcinoma-type

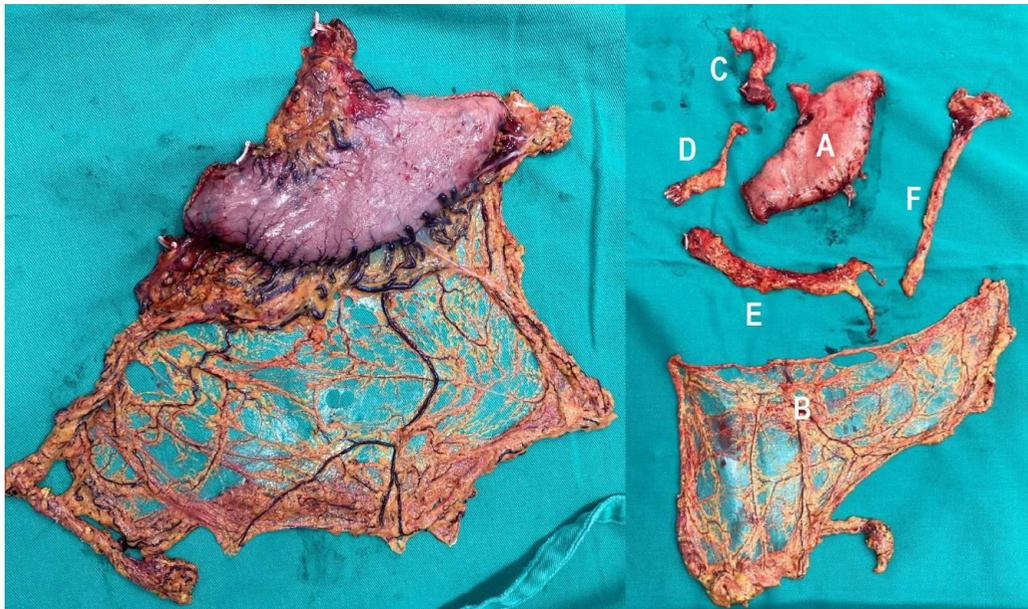
gastric cancer, between April 2018 and May 2023, in the Gastrointestinal Surgery Service of the Risaralda Section Liga Contra el Cáncer, in the city of Pereira, Colombia. Patients with incomplete medical records were excluded.

Surgical specimens were divided into two groups: Group A, corresponded to patients whose specimen was not modified after extraction and was sent complete without any division as a single pathology specimen. Group B, the treating surgeon divided the specimen immediately after the procedure and prior to send it to the Pathology Department, into 6 groups as follows: a. Gastrectomy (total or subtotal); b. Greater omentum; c. Right paracardial lymph nodes (group 1), lesser curvature (groups 3a and 3b), left gastric artery (group 7), common hepatic artery (group 8a), celiac trunk (group 9), splenic hilum and splenic artery (groups 10, 11p and d); d. Suprapyloric nodes (group 5), hepatoduodenal ligament (group 12a); e. Infrapyloric ganglia (group 6); F. Ganglia of the greater curvature (groups 4sa and sb), left paracardial (group 2); and for tumors of the

esophagogastric junction, infradiaphragmatic, esophageal hiatus, paraesophageal and diaphragmatic nodes were included (groups 19, 20, 110, 111) (Figure 1).

Data were taken from primary sources of information and collected in a Microsoft Excel spreadsheet. Statistical analysis was performed using SPSS version 19 (Copyright® SPSS Inc., 2000). The clinical and sociodemographic variables of age and sex were analyzed. The variables were described using statistical methods appropriate to the nature and measurement scale of each one, mainly mean and standard deviation for quantitative variables, in addition to establishing distributions and absolute frequencies and percentages for qualitative variables.

A comparison was made between patients whose surgical specimen was studied en bloc (group A) with those in whom the lymph node groups were separated for analysis (group B), as well as the time required by the surgeon when performing the lymph node division, The Chi<sup>2</sup> test was used in the qualitative variables and the student T test in the quantitative variables.



**Figure 1.** Left, surgical specimen from group A, without modification after extraction. Right, specimen from group B, in which a division by lymph node groups was performed.

## Results

Ninety-four patients undergoing total (n=36) and subtotal (n=58) gastrectomy, with D2 lymph node dissection for the treatment of gastric cancer, by the Gastrointestinal Surgery Service were included. In group A there were 26 patients with total gastrectomy vs 39 subtotal, while in group B there were 10 patients with total gastrectomy vs 19 subtotal. The average age was 63.5 years, with a range between 31 and 88 years; 51.8% were men and 48.2% were women.

Of the total number of patients who underwent surgery, 65 were part of group A and 29 patients were part of group B. The average number of lymph nodes was  $24.43 \pm 8.62$  and  $32.48 \pm 14.44$ , respectively ( $p=0.004$ ). The percentage of patients with more than 15 and 25 nodes was lower in group A than in group B (27 vs 57,  $p=0.432$  and 19 vs 24,  $p=0.014$ ). The average number of patients with a nodal ratio less than 0.2 was higher in group B (72.4% vs 55.4%,  $p=0.119$ ) (Table 1).

Of the 36 total gastrectomies performed, 26 were included in group A and 10 in group B. The

average number of nodes was  $26.54 \pm 8.4$  and  $32.3 \pm 13.9$ , respectively ( $p=0.135$ ). The percentage of patients with more than 15 and 25 nodes was lower in group A than in group B (10 vs 25,  $p=1$  and 5 vs 10,  $p=0.709$ ). The average number of patients with a nodal ratio less than 0.2 was higher in group A (53.8% vs 50%,  $p=1$ ) (Table 2).

Of the 58 subtotal gastrectomies performed, 39 belonged to group A and 19 to group B. The average number of nodes was  $23.03 \pm 8.6$  and  $32.58 \pm 15.08$ , respectively ( $p=0.004$ ). The percentage of patients with more than 15 and 25 nodes was lower in group A than in group B (17 vs 32,  $p=0.703$  and 14 vs 14,  $p=0.011$ ). The average number of patients with a nodal ratio less than 0.2 was higher in group B (73.7% vs 35.9%,  $p=0.011$ ) (Table 3).

Finally, the time required to divide the specimen immediately after completing the surgical procedure was counted. The average time needed was 329 seconds (5 minutes and 29 seconds), with a range between 221 (3 minutes and 41 seconds) and 434 seconds (7 minutes and 14 seconds).

**Table 1.** Lymph node count in patients with total or subtotal gastrectomy.

Total and subtotal gastrectomies (n=94)	Group A (n=65)	Group B (n=29)	p-value
Resected lymph nodes, average (SD)	$24.43 \pm 8.62$	$32.48 \pm 14.44$	0.004
Positive lymph nodes, average (SD)	$6.51 \pm 8.03$	$4.38 \pm 6.03$	0.510
Lymph node count > 15, n (%)	57 (87.7%)	27 (93.1%)	0.432
Lymph node count > 25, n (%)	24 (36.9%)	19 (65.5%)	0.014
Nodal relationship < 0.2, n (%)	36 (55.4%)	21 (72.4%)	0.119

Source: own elaboration of the authors.

**Table 2.** Lymph node count of patients with total gastrectomy.

Total gastrectomies (n=36)	Group A (n=26)	Group B (n=10)	p-value
Resected lymph nodes, average (SD)	$26.54 \pm 8.4$	$32.3 \pm 13.9$	0.135
Positive lymph nodes, average (SD)	$8.12 \pm 9.67$	$7.5 \pm 7.8$	0.490
Lymph node count > 15, n (%)	25 (96.2%)	10 (100%)	1
Lymph node count > 25, n (%)	10 (38.5%)	5 (50%)	0.709
Nodal relationship < 0.2, n (%)	14 (53.8%)	5 (50%)	1

Source: own elaboration of the authors.

**Table 3.** Lymph node count of patients with subtotal gastrectomy.

Subtotal gastrectomies (n=58)	Group A (n=39)	Group B (n=19)	p-value
Resected lymph nodes, average (SD)	23.03 ± 8.6	32.58 ± 15.08	0.004
Positive lymph nodes, average (SD)	5.44 ± 6.6	2.74 ± 4.1	0.725
Lymph node count > 15, n (%)	32 (82.1%)	17 (89.5%)	0.703
Lymph node count > 25, n (%)	14 (35.9%)	14 (73.7%)	0.011
Nodal relationship < 0.2, n (%)	22 (56.4%)	16 (84.2%)	0.044

Source: own elaboration of the authors.

## Discussion

The results of our study show that the lymph node count increases significantly when performing a lymph node division by region immediately after the procedure and prior to sending it to the Pathology Department for reading, confirming that the pathology report can be influenced by factors unrelated to surgery. Additionally, our results suggest a higher percentage of patients with a lymph node count greater than 15 among patients with lymph node division by region and confirm a greater number of patients with a lymph node count greater than 25 and with a lymph node ratio less than 0.2. in those with subtotal gastrectomy.

The lymph node count establishes one of the different criteria that allows establishing that a gastrectomy is adequately performed in patients with cancer. The American Joint Committee on Cancer (AJCC) recommends a minimum of 16 nodes for adequate staging and this allows appropriate treatment to be offered to patients, avoiding overtreatment<sup>8</sup>. Our study showed that, despite performing a standard oncological procedure by a specialist trained in cancer management, factors other than the procedure may be related to the minimum lymph node count.

In the same way that the minimum number of resected nodes is relevant, an increase in the number of resected and involved nodes represents an independent prognostic factor for patients with gastric cancer<sup>9</sup>. Among our patients we found that when performing a lymph node division before sending the surgical specimen to the pathology service, the number of patients with a lymph node count greater than 25 increases significantly, both in total and subtotal gastrectomies.

On the other hand, we observed that lymph node division allows us to obtain a greater number of patients with a lymph node ratio less than 0.2 overall and in patients with subtotal gastrectomy. When the ratio resulting from the quotient between the number of positive lymph nodes divided by the total number of dissected nodes is greater than 0.2, it is an independent factor of poor prognosis, which is associated with greater aggressiveness, progression and dissemination of the disease<sup>8</sup>.

Although it is true that the prognosis of our patients does not worsen or improve when performing a lymph node division, it does allow the patient's stage and prognosis to be established with a greater degree of certainty, offering the oncologist and surgeon the possibility of providing better information. to the patient and family. Likewise, studies suggest that a node count of more than 30 lymph nodes could improve staging accuracy in patients with T3 tumor stage, while the AJCC recommends a node count of at least 30 lymph nodes for more accurate staging<sup>8</sup>.

Finally, In et al.<sup>10</sup> suggest that in the presence of suboptimal lymph node counts in patients with select stages (T2N0), they benefit from receiving adjuvant treatment with chemotherapy. Thus, the results emphasize the importance of adequate staging to avoid unnecessary overtreatment.

## Conclusions

Our results demonstrate, despite the limitations of the study, such as the sample size, that a division of the surgical specimen immediately after the procedure and prior to send it for evaluation by the Pathology Department, which requires little time

from the surgeon, increases the lymph node count and allows to accurately establish the prognosis of the patients, having a positive impact on their staging, avoiding in some cases the overtreatment of patients with gastric cancer.

### Compliance with ethical standards

**Informed consent:** Because it was a review study of a retrospective patient database, it was considered risk-free and informed consent was not requested from the patients. The study was approved by the Bioethics Committee of the Risaralda Section Liga Contra el Cáncer, under the category of risk-free research, and the confidentiality principles established by the Declaration of Helsinki were followed. The scientific, technical and administrative standards for health research were taken into account in accordance with Resolution number 8430 of 1993.

**Conflict of interest:** none declared by the authors.

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### Author's contributions

- Conception and design of the study: Bernardo Borráez-Segura, Felipe Anduquia-Garay, Valentina Santa-Gil, Mario Erazo, Juliana Gómez-Raigosa, Giovanni García, Paydieg Nathalia Márquez-Parra, Yesica Cardona, Juanita Santa-Gil, Natalia Ochoa.
- Acquisition of data: Bernardo Borráez-Segura, Felipe Anduquia-Garay, Valentina Santa-Gil, Mario Erazo, Juliana Gómez-Raigosa, Giovanni García, Paydieg Nathalia Márquez-Parra, Yesica Cardona, Juanita Santa-Gil, Natalia Ochoa.
- Data analysis and interpretation: Bernardo Borráez-Segura, Felipe Anduquia-Garay, Valentina Santa-Gil, Mario Erazo, Juliana Gómez-Raigosa, Giovanni García, Paydieg Nathalia Márquez-Parra, Yesica Cardona, Juanita Santa-Gil, Natalia Ochoa.
- Drafting the manuscript: Bernardo Borráez-Segura, Felipe Anduquia-Garay, Valentina Santa-Gil, Mario Erazo, Juliana Gómez-Raigosa, Giovanni García, Paydieg Nathalia Márquez-Parra, Yesica Cardona, Juanita Santa-Gil, Natalia Ochoa.

- Critical review: Bernardo Borráez-Segura, Felipe Anduquia-Garay, Valentina Santa-Gil, Mario Erazo, Juliana Gómez-Raigosa, Giovanni García, Paydieg Nathalia Márquez-Parra, Yesica Cardona, Juanita Santa-Gil, Natalia Ochoa.

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