

Reconstructive Surgery in Patients with Rheumatoid Arthritis

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Abstract

Objective: The aim of this research was to find out if reconstructive surgery is the best option to improve the quality of life of patients with rheumatoid arthritis compared to other monotherapy or combination therapy treatments. **Methods:** The research uses a mixed qualitative-quantitative, correlational, and cross-sectional approach. The medical records of a sample of 28 patients with rheumatoid arthritis who were treated at Rio Hospital in Riobamba-Ecuador in the period 2022-2024 were reviewed. The Health Assessment Questionnaire (HAQ) was used to assess quality of life, and the Diseases Activity Score (DAS) 28 was used to measure the degree of joint involvement. To establish the correlation between variables, HJ Biplot multivariate analysis was applied in RStudio. **Results:** A high correlation was found between quality of life and the degree of joint involvement DAS 28, patients with a degree of high activity (more unfavorable condition) have a worse quality of life due to their severe disability. Both quality of life and the degree of joint involvement were also correlated with the treatment they receive, patients with worse quality of life and a higher degree of joint involvement received combined therapy as treatment. Patients who have undergone reconstructive surgery have a better quality of life. Overweight patients tend to have greater joint involvement and poorer quality of life. **Conclusions:** The results suggest that reconstructive surgery plays an important role in the management of patients with advanced rheumatoid arthritis, helping to restore function and improve quality of life.

Keywords

Surgery, Reconstructive, Arthritis, Rheumatoid

1. Introduction

Rheumatoid arthritis (RA) is a chronic autoimmune disease that primarily affects

the joints, causing inflammation, pain, and eventual deformities. Conventional treatments for RA include anti-inflammatory medications, immunosuppressants, and biological therapies. However, in advanced cases where the joint is severely damaged, reconstructive surgery becomes necessary to restore function and improve the patient's quality of life.

RA is a very complicated orthopedic condition. If it cannot be treated reasonably well, it can greatly affect the quality of life of patients with RA and can even cause disability. Total knee arthroplasty (TKA) has been reported to treat patients with RA effectively. However, no study has systematically explored its efficacy and complications for patients with RA [1].

Reconstructive surgery is essential in patients with rheumatoid arthritis for several important reasons. Rheumatoid arthritis causes chronic joint inflammation, which can result in severe pain and functional disability. Reconstructive surgery can help alleviate this pain by correcting deformities and restoring normal joint function.

This disease can cause severe joint deformities, significantly limiting the patient's ability to perform daily activities. Reconstructive surgery can correct these deformities and restore joint function, allowing the patient greater mobility and quality of life. Rheumatoid arthritis can lead to progressive disability as the disease advances, especially if not properly treated, and reconstructive surgery can help prevent disability by correcting joint problems before they become irreversible, allowing the patient to maintain their independence and autonomy.

By relieving pain, improving joint function, and preventing disability, reconstructive surgery can have a significant impact on the quality of life of patients with rheumatoid arthritis. It allows them to participate more fully in daily activities, maintain social relationships, and enjoy a more active and satisfying life.

Reconstructive surgery not only addresses the symptoms and complications of rheumatoid arthritis but can also complement other treatments, such as pharmacotherapy and physical therapy. By working together with these treatments, surgery can help optimize outcomes and improve the patient's long-term prognosis. Surgery plays an important role in the management of RA throughout its evolution. It should not be considered a terminal resource in patients who do not respond to medical therapy, but rather a complement to it. The concept of surgery is another form of therapy, just as disease-modifying drugs are. More than 50% of patients with RA have been gone through surgery at least once. It is important to consider the perioperative medical evaluation of rheumatic patients.

Various factors must be taken into account in patients with RA who are candidates for reconstructive surgery, requiring careful evaluation. The coronary risk should be considered mainly because these patients have a higher risk of coronary disease than the general population, and due to physical limitations, they may be asymptomatic. Patients without clinical markers of coronary risk or those with coronary revascularization in the last five years and asymptomatic have a very low risk, and further evaluation does not seem necessary. If risk factors exist, they

should be evaluated by a cardiologist and possibly studied with preoperative stress tests. Another important risk related to chronic corticosteroid therapy is the common practice of using intravenous “stress” doses of corticosteroids in chronic steroid users. A practice that does not have sufficient evidence in the literature. A recent study conducted in patients undergoing orthopedic surgery (in which the baseline dose of corticosteroids was used) did not demonstrate clinical or laboratory evidence of adrenal insufficiency. However, to date, it seems advisable to continue using perioperative corticosteroids.

RA primarily affects women and can cause severe inflammation, stiffness, and joint pain, limiting daily activities. As the disease progresses, patients may develop rheumatoid nodules and joint deformities, often requiring surgical interventions to restore function and improve the aesthetics of the affected limbs.

Based on studies conducted in RA arthritis, it was possible to identify the gap regarding considering reconstructive surgery as an alternative in the treatment of RA. Based on this relevant background, the research topic is proposed to fill this academic gap and contribute to improving the quality of life of patients with RA.

In this article there are no conflicts of interest, neither private nor institutional. Since there was no Ethics Committee at the hospital where the study was conducted, a certificate was obtained from the director attesting to the veracity of the data.

1.1. The Problem

RA can lead to significant joint deformities, such as subluxations, dislocations, contractures, and bone erosions, resulting in loss of function and disability. These deformities can affect both large joints, such as the knees and hips, as well as small joints, such as those in the hands and feet. Reconstructive surgery faces unique challenges in these patients, including persistent inflammation, osteoporosis, and bone fragility.

One of the main challenges in managing RA is the need for reconstructive surgery to address the joint deformities and dysfunctions that develop over time. The problem to be investigated focuses on whether reconstructive surgery is truly the best option for improving the quality of life of patients with rheumatoid arthritis compared to other treatments, whether monotherapy or combination therapy.

1.2. Objectives

Evaluate the efficacy and safety of reconstructive surgery, monotherapy, and combination therapies in terms of functional improvement, pain relief, and quality of life.

Review the main types of reconstructive surgery used in patients with RA.

Discuss the considerations and challenges in decision-making regarding reconstructive surgery in this population.

1.3. Justification

RA is a progressive disease that can cause significant disability if not adequately

treated. Although medical treatments have advanced in recent decades, some patients still experience substantial joint deterioration that requires surgical intervention. Therefore, it is crucial to explore and understand the available surgical approaches to optimize the care of these patients and improve their long-term outcomes.

Reconstructive surgery plays a vital role in the comprehensive management of patients with rheumatoid arthritis. These procedures can help restore joint function, alleviate pain, and enhance the quality of life for patients. However, decision-making regarding reconstructive surgery in patients with RA can be complex, as factors such as disease activity, the functional status of the patient, and the risks associated with surgery must be considered. Thus, it is important to gain a better understanding of the role of reconstructive surgery in managing RA, its outcomes, and the factors that influence these outcomes. This knowledge can assist healthcare professionals in making more informed decisions and optimizing results for patients with RA.

2. State of the Art

2.1. Reconstructive Surgery in Patients with RA

Reconstructive surgery in patients with RA has evolved significantly over the past few decades. Multiple surgical techniques have been developed to address the various manifestations of the disease. These include total knee and hip arthroplasties, hand arthroplasty, synovectomy, osteotomy, and arthrodesis. These procedures can be performed either in isolation or in combination, depending on the specific needs of each patient.

Total knee arthroplasty in patients with RA provides satisfactory outcomes in terms of pain relief and functional improvement in both the short and long term. Patients with RA often face the necessity of this surgery due to chronic pain, stiffness, and loss of joint function due to not responding to more conservative treatments, such as anti-inflammatory medications, physical therapy, and lifestyle changes. Hip replacement surgery can significantly enhance quality of life by reducing pain and improving mobility [2].

However, despite advancements in reconstructive surgery, significant challenges persist. Chronic inflammation and bone fragility can increase the risk of perioperative complications, such as infection, implant failure, and periprosthetic fractures. Additionally, appropriate candidate selection for surgery and perioperative management of the disease are critical aspects that require specialized attention.

Reconstructive surgery in patients with rheumatoid arthritis has been extensively studied in medical literature. Several studies have examined the different types of surgical procedures used, such as hip and knee arthroplasty, arthrodesis, synovectomy, and reconstruction of tendons and ligaments. Hand reconstructive surgery is a subspecialty of orthopedics and/or plastic surgery focused on the surgical management of complex pathologies in the upper extremity, which may arise

from accidental trauma, congenital degenerative diseases, rheumatoid arthritis, or overuse injuries, including conditions affecting the brachial plexus, shoulder, elbow, wrist, and hand [3].

In comparison to osteoarthritis, rheumatoid arthritis presents several unique situations regarding total knee arthroplasty (TKA). Adverse factors include the generally multiarticular involvement of both upper and lower extremities, lower bone quality, advanced joint damage at an early age, variable degrees of deformity, especially valgus deformity, the use of corticosteroids and immunosuppressive medications, nutritional compromise, poor healing, increased infection rates, and severe soft tissue involvement, particularly in juvenile rheumatoid arthritis [4].

However, factors influencing the outcomes of reconstructive surgery have also been identified, such as disease activity, the prior functional status of the patient, and the presence of comorbidities. Additionally, some studies have indicated that patients with RA may have a higher risk of postoperative complications compared to the general population.

Reconstructive surgery plays an important role in managing patients with rheumatoid arthritis, but careful evaluation of individual patient factors and potential risks and benefits is required to optimize outcomes. Joint replacements (arthroplasties) of the hip and knee are currently surgical procedures routinely performed worldwide to address arthritic and traumatic issues.

2.2. Surgical Procedures in Patients with Rheumatoid Arthritis

If medical treatment is effective, the evolution stops or is delayed, the surgeon will find conditions in which the mechanical component predominates over the inflammatory component, which evolve like osteoarthritis and in which the same procedures are performed. Isolated synovectomies are becoming less frequent and ideally performed arthroscopically. Prosthetic arthroplasties are widely used in the proximal joints (hip and knee, shoulder and elbow, metacarpophalangeal); they are an alternative to arthrodesis in the distal joints (ankle and wrist, proximal interphalangeal); arthrodesis is still widely used in the spine, hindfoot, and first toe. Patients with RA are more fragile and more exposed to infectious and mechanical complications. Therapeutic indications should be discussed with the rheumatologist and, if possible, with a rehabilitation specialist [5].

It is important to remember that surgery does not correct the underlying disease, but rather helps to correct the deformities caused by it. Careful follow-up is required for optimal control of the pathology.

2.3. Rheumatoid Arthritis

RA is a chronic systemic inflammatory disease characterized by polyarticular inflammation that leads to the development of bone erosions and joint dysfunction. It affects approximately 0.5% - 1% of the world's population, with a higher prevalence in women than in men, with a ratio of up to 11:1 [6].

RA is a chronic multisystemic inflammatory disease of unknown etiology and

autoimmune nature that predominantly affects the peripheral joints symmetrically. Although significant progress has been made in understanding the pathophysiology of RA, its etiology remains unknown [7].

The main symptoms of RA include pain, inflammation, and stiffness in the joints, which can lead to long-term disability if not treated adequately. Diagnosis is based on the detection of serological markers such as rheumatoid factor and anti-cyclic citrullinated peptide antibodies. The evolution of RA is insidious. Initially, it manifests with general symptoms that are later accompanied by characteristic symptoms, including polyarticular involvement with symmetric distribution, extraarticular manifestations, systemic and biochemical manifestations [8].

Some studies have shown that therapy with conventional synthetic disease-modifying antirheumatic drugs, biologics, and/or corticosteroids can influence deoxyribonucleic acid (DNA) methylation status. This methylation is exerted by a family of DNA methyltransferases, which are inhibited or activated by various epigenetic drugs and consequently modulate gene expression [9].

The treatment of RA requires a multidisciplinary approach, including medications such as anti-inflammatories, disease-modifying antirheumatic drugs, and biologic therapies, as well as physical therapy and patient education.

The goal of treatment is to stop disease progression and prevent joint damage. Rheumatoid arthritis is a complex and chronic disease that requires comprehensive management to improve patients' quality of life and prevent long-term complications.

2.4. Quality of Life in Patients with Rheumatoid Arthritis

The quality of life of patients with RA is significantly affected by this chronic and debilitating disease. Various studies have shown that patients with RA have a poorer quality of life in multiple areas, such as physical function, pain, mental health, and social functioning. RA can cause various degrees of deformity, leading to functional disability that generates a poorer health-related quality of life compared to the general population and premature mortality [10].

The main instruments used to measure quality of life in patients with RA are the generic questionnaire Medical Outcome Study Short-Form 36 (SF-36), the specific questionnaire Rheumatoid Arthritis Quality of Life (RAQoL), and the DAS28 questionnaire [11].

RA has a significant impact on patients' quality of life, affecting multiple dimensions such as physical, mental, and social. It is important to use validated instruments to assess quality of life in order to provide comprehensive management that improves the well-being of these patients.

3. Materials and Methods

The research has a mixed, qualitative-quantitative, correlational, and cross-sectional approach. The qualitative method focuses on understanding phenomena through perceptions, experiences and meanings and the quantitative method uses numerical

data to perform statistical analysis, allowing generalizations about a phenomenon from representative samples. The bibliographic review technique was used for the theoretical foundation of the research, which includes consulting bibliography related to the topics related to the subject. Additionally, a review of patient medical records treated at Rio Hospital during the period 2022-2024 was conducted.

The sample for a finite population was calculated using equation 1 [12]:

$$n = \frac{NpqZ^2}{(N-1)e^2 + pqZ^2} \quad (1)$$

Where:

N = population size (30);

e = margin of error (5% = 0.05);

Z = confidence level, probability that the answers are correct (1.96 for 95%);

p = probability of success, proportion of individuals in the population who possess a specific characteristic (0.5 for 50%);

q = probability of failure, proportion of individuals who do not possess a specific characteristic (0.5 for 50%);

pq = 0.25;

n = sample size = 28.

The process of presenting the idea to be investigated started with previous meetings between the researchers participating in this study to analyze the feasibility and relevance of the proposed study. To carry out the research, the target group was identified and then the sample was selected. To obtain and organize data, the questionnaires to be used were analyzed and the records of patients with RA were reviewed. For the statistical analysis, the variables of interest and the descriptive and inferential statistical techniques were identified. For the drawing of graphics, a code was developed in Rstudio designed to perform a HJ-Biplot analysis on a set of clinical history data using various R packages.

The variables considered in the study were: age, gender, body mass index, duration of RA disease, degree of joint involvement DAS28 scale, type of treatment, time elapsed from the diagnosis of RA until treatment was received, improvements in joint mobility and functionality after treatment HAQ, and present comorbidities.

To assess the degree of joint involvement, the DAS28 questionnaire was used, which is a composite index utilized to evaluate the activity of RA. It was developed in 1993 by van der Heijde *et al.* and has established itself as the primary parameter for assessing disease activity and making therapeutic decisions. The scores are interpreted as follows:

DAS28 < 2.6: remission

2.6 ≤ DAS28 ≤ 3.2: low disease activity

3.2 < DAS28 ≤ 5.1: moderate disease activity

DAS28 > 5.1: high disease activity

To evaluate improvements in joint mobility and functionality after treatment, the HAQ was used, which is a widely utilized instrument for assessing the

functionality and disability of patients with RA. Some key features of the HAQ questionnaire include: evaluation of the patient's ability to perform 20 activities of daily living across 8 categories (dressing, rising, eating, walking, hygiene, reaching, gripping, and common daily activities). Each activity is scored from 0 (no difficulty) to 3 (unable to do it).

The final score is the average of the 8 categories, with a range from 0 (no disability) to 3 (severe disability).

Descriptive statistics with frequencies and measures of central tendency were used to characterize the variables, and then multivariate analysis using HJ biplot [13] was applied in RStudio in a reduced-dimensional space for graphical representation of the correlations.

The roadmap followed in this study includes the following topics:

Study of art

Definition of the academic gap

Identification of the target group

Selection and application of the methodology

Analysis of results

Conclusions

For the development of codes in Rstudio, the following procedure was followed:

Loading packages for the Technique: HJ Biplot

library (pacman), p_load (readxl), tidyverse, MultBiplotR, BiplotML, janitor, here, skimr, foreign, factoextra, FactoMineR, Factoshiny, FactoInvestigate, explor, BiplotGUI, corrplot, patchwork, RSpectra.

Creating a database in Excel

Cleaning the environment

Loading packages for statistical tests

Loading and preparing data

Reading the Excel file

Exploring and selecting data:

HJ-Biplot analysis

Performing the HJ-Biplot analysis

Visualizing inertia

Contributions and coordinates:

Summary and visualization of the Biplot

4. Results

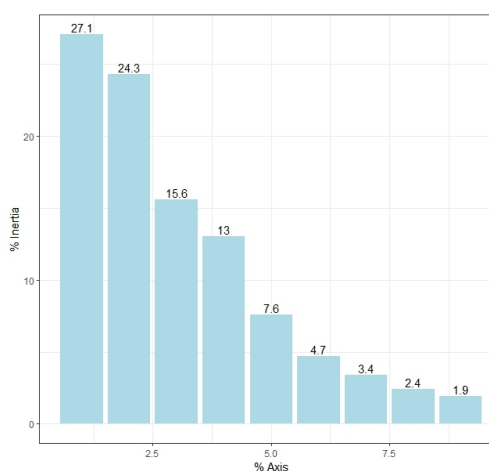
Table 1 shows the descriptive values of the variables considered in the study. The patients have an average age of 41.82 years; an average BMI of 24.11; they have suffered from rheumatoid arthritis for an average of 5.07 years, and the average degree of joint involvement according to the DAS28 scale was 3.32, which corresponds to moderate activity, although some patients reach values as high as 8.2, which is considered high activity. The average time elapsed from the diagnosis of RA until treatment is received was 16.68 months (1.39 years); the average quality

of life score was 1.50, which falls between low and moderate disability. The majority of patients (39.3%) receive combination therapy, with 3 patients receiving MTX + leflunomide; 2 patients receiving MTX + sulfasalazine; 3 patients receiving MTX + hydroxychloroquine; 2 patients receiving MTX + etanercept; and 1 patient receiving MTX + adalimumab. The majority of patients belong to the female gender (85.7%). The main comorbidity was hypertension (25%).

Table 1. Descriptive Statistics of the Variables.

		n (%)
Age (years), average \pm SD		41.82 \pm 12.41 MIN = 21; MÁX = 66
BMI (kg/m ²), average \pm SD		24.11 \pm 2.96 MIN = 19.3; MÁX = 32.5
Disease duration (years), average \pm SD		5.07 \pm 3.51 MIN = 0.5; MÁX = 13
DAS28 score		3.32 \pm 2.11 MIN = 0.5; MÁX = 8.2
Time Elapsed from RA Diagnosis to Treatment Received (months)		16.68 \pm 16.34 MIN = 1; MÁX = 48
Improvements in Joint Mobility and Functionality After Treatment (HAQ)		1.5 \pm 1.10 MIN = 0; MÁX = 3
Type of Treatment Received	High Disease Activity in Remission	7 (25.0)
	Medications: Monotherapy	7 (25.0)
	Medications: Combination Therapy	11 (39.3)
Gender	Surgery	3 (10.7)
	Male	4 (14.3)
	Female	24 (85.7)
Present Comorbidities	None	20 (71.4)
	Hypertension	7 (25.0)
	Hypothyroidism	1 (3.6)

Source: Medical Records Registry.



Source: Medical Records Registry.

Figure 1. Percentage of inertia for each variable.

The inertia of each extracted dimension or factorial axis represents the proportion of the total variability explained by each dimension.

Low inertia indicates that the profiles (rows or columns) of the table are very close to the average profile, *i.e.*, they are very similar to each other. In Graph 1, it can be observed that 4 variables have very low percentages of inertia: 4.7%, 3.4%, 2.4%, and 1.9%, respectively.

On the contrary, high inertia implies that there are large differences between the profiles of the rows or columns, as is the case for the variables with a range of inertia percentages between 7.6% and 27.1%, *i.e.*, these are the variables that provide the most information for the analysis and interpretation of the results.

Table 2. Contributions of the variables to each of the three axes.

Variables	Dim 1	Dim 2	Dim 3
Age	14.13	0.38	57.94
Gender	7.08	2.29	31.85
BMI	7.63	22.91	4.17
Time_RA	67.05	4.63	5.39
Das 28	0.11	86.20	0.02
Treatment	29.01	34.26	25.44
Diagnosis	73.66	0.01	3.88
HAQ	0.73	67.57	6.25
Comorbidity	44.19	0.31	5.02

Source: Database run in RStudio.

The percentages shown in **Table 2** for the three-dimensional plane indicate on which axis each variable is best represented.

73.66% of the information for the variable “Time Elapsed from RA Diagnosis to Treatment Received” is applied to Axis 1; “Duration of RA Disease” contributes 67.05%, and “Comorbidity” contributes 44.19%. These are the variables that are best represented on Axis 1. Meanwhile, the “Degree of Joint Involvement (DAS28)” contributes 86.20% to the construction of Axis 2, along with “Quality of Life,” which contributes 67.57%, and “Type of Treatment Received,” which contributes 34.26%. These variables are better represented on Axis 2. On Axis 3, the variables “Age” (57.94%) and “Gender” (31.85%) are better represented (See **Table 2**).

Based on the contribution of the variables to the axes, Axes 1 and 2 would be sufficient for creating an HJ Biplot. However, for the sociodemographic variables “Age” and “Gender”, which are better represented on Axis 3, an HJ Biplot should be created using Axes 1 and 3, as these are the axes where these variables are best represented.

Regarding the contribution of the patients to each factorial axis, patients 20, 15, 12, 21, 28, and 27 provide the most information to Axis 1, with percentages of 79.02%, 75.33%, 70.08%, 68.53%, 63.54%, and 39.63%, respectively. On Axis 2, the patients best represented are 9, 25, 11, 13, and 3, with contributions of 71.72%,

56.79%, 56.30%, 52.28%, and 49.56%, respectively. For Axis 3, the patients best represented are 18 and 26, with contributions of 46.35% and 38.22%, respectively (See **Table 3**).

Table 3. Contributions of the individuals to each of the three axes.

Patients	Dim 1	Dim 2	Dim 3
Patient 1	19.19	29.34	28.61
Patient 2	52.59	14.84	13.14
Patient 3	20.72	49.56	11.14
Patient 4	29.96	5.96	2.71
Patient 5	2.77	57.91	4.82
Patient 6	52.27	3.68	11.13
Patient 7	22.85	14.04	1.30
Patient 8	6.68	34.68	5.07
Patient 9	4.46	71.72	0.44
Patient 10	42.37	29.63	9.20
Patient 11	3.59	56.30	2.77
Patient 12	70.08	1.37	14.70
Patient 13	20.92	52.28	1.78
Patient 14	0.09	45.03	2.18
Patient 15	75.33	1.43	7.78
Patient 16	0.10	26.25	0.40
Patient 17	14.93	27.25	26.47
Patient 18	7.83	29.14	46.35
Patient 19	13.74	9.12	22.57
Patient 20	79.02	2.21	8.11
Patient 21	68.53	9.55	5.19
Patient 22	51.37	22.31	8.07
Patient 23	21.33	30.98	34.59
Patient 24	4.94	33.04	3.44
Patient 25	9.15	56.79	10.86
Patient 26	25.09	11.43	38.22
Patient 27	39.63	7.91	11.97
Patient 28	63.54	4.93	21.67

Source: Database run in RStudio.

When interpreting the graph, it is very important to consider both the size and the intensity of the colors of the circles.

Large circles: Indicate a larger contribution or percentage of the variable relative to the total. The larger the circle, the greater its impact or relevance in the context of the graph.

Small circles: Represent a smaller contribution or percentage. These circles suggest that the variable has a less significant impact compared to others.

More intense colors: Generally, indicate a higher importance or a higher level of a specific characteristic.

Softer or paler colors: Suggest a lower importance or a lower level in the same metric. This helps to quickly visualize which variables are more critical and which

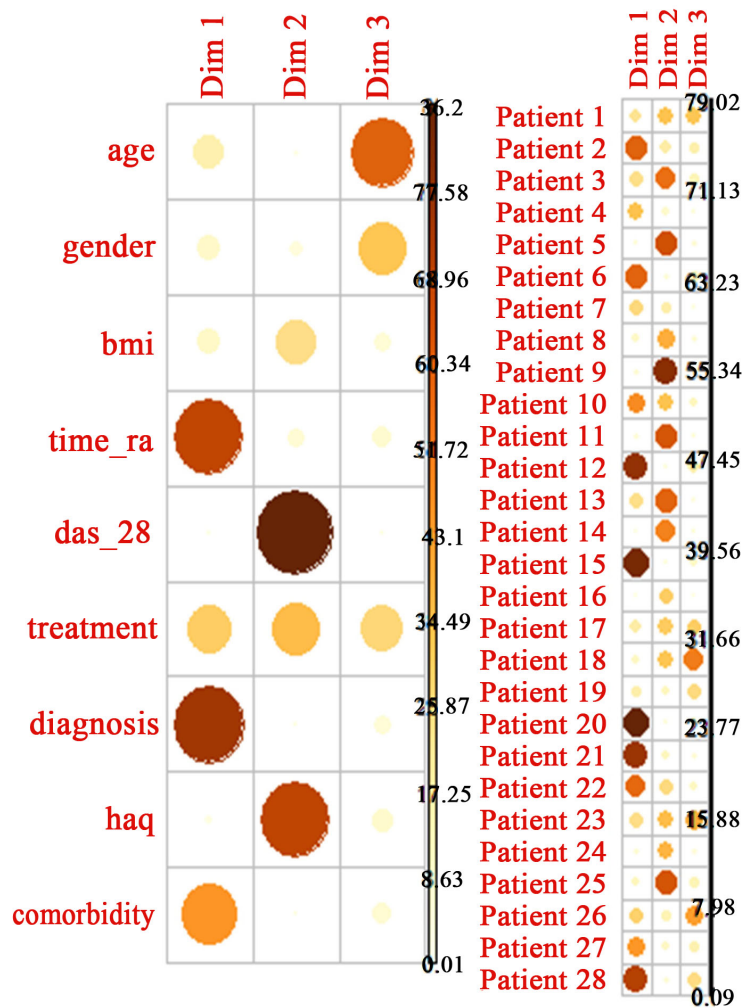
are less relevant.

This type of graphical representation allows observers to quickly interpret the relationships and contributions between different variables in three-dimensional space.

In **Figure 2**, the values from **Tables 2 and 3** are plotted. It is clear that the main contributions to Axis 1 are provided by the variables: “Time Elapsed from RA Diagnosis to Treatment Received”, “Duration of the Disease” and “Comorbidity”.

On Axis 2, the variables “Degree of Joint Involvement (DAS28)”, “Quality of Life” and “Type of Treatment Received” are well represented. On Axis 3, the variables best represented are “Age” and “Gender”.

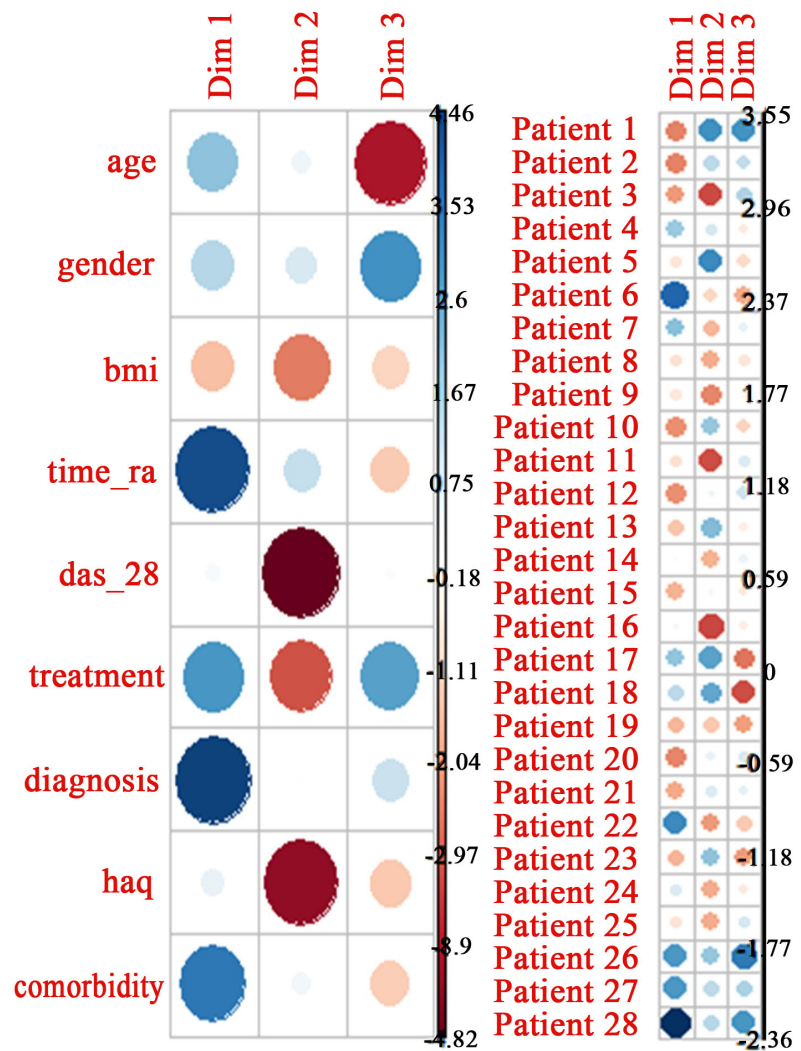
Similarly, the contributions of information for Axis 1 come from patients 20, 15, 12, 21, 28, and 27, who share characteristics in the context of all the variables that position them on this axis. On Axis 2, patients 9, 25, 11, 13, and 3 are well represented. On Axis 3, the patients best represented are 18 and 26, who share similar characteristics.



Source: Medical Records Registry.

Figure 2. Representation of the variables and individuals on three axes.

Figure 3 indicates that a higher degree of joint involvement on the DAS28 scale corresponds to a poorer quality of life as measured by the HAQ scale. The group of patients receiving combination therapy have a poorer quality of life compared to those who underwent reconstructive surgery. Patients with high activity on the DAS28 scale receive combination therapy, while those with low activity or whose disease is in remission receive only monotherapy. A high body mass index contributes to greater joint involvement and deterioration of quality of life.



Source: Medical Records Registry.

Figure 3. Coordinates for the association of columns (variables) and rows (individuals).

In the interpretation of the HJ Biplot, it is very important to analyze the measurement of the angle formed by the variables as well as the length of the vectors that represent each variable.

Small angle (close to 0°): Indicates that the variables are positively correlated. This means that when one variable increases, the other also tends to increase.

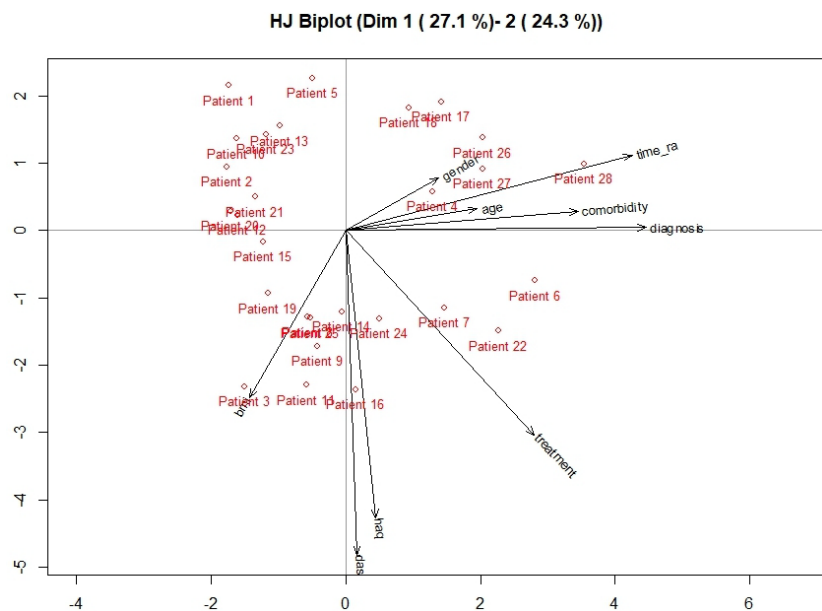
Large angle (close to 180°): Suggests that the variables are negatively correlated.

In this case, an increase in one variable is associated with a decrease in the other.

Angle of approximately 90°: Indicates that the variables are independent or uncorrelated. There is no linear relationship between them.

Long vectors: These represent variables that have a larger variance or contribution in the data set. This indicates that these variables are more important and have a greater impact on the variability of the data set.

Short vectors: These indicate variables with a lower variance or contribution. These variables may be less relevant in the context of the analysis and do not contribute significantly to the structure of the data set.



Source: Medical Records Registry.

Figure 4. HJ Biplot correlations based on individuals.

The simultaneous multivariate representation of the HJ Biplot allows us to observe the correlations between the variables under study based on the characteristics of each patient. There is a high correlation between “Quality of Life” and “Degree of Joint Involvement DAS28”. The patients associated with this correlation are patients 14, 16, 24, 9, 11, and 25, who have severe or moderate disability according to the HAQ and exhibit moderate to high activity with values above the average on the DAS28 scale. Consequently, there is sufficient statistical evidence to assert that greater joint involvement corresponds to a poorer quality of life for patients, and vice versa.

There is also a strong correlation between “Quality of Life” and “Type of Treatment Received”. The patients in this group include patients 14, 16, 24, 6, 7, and 22, who have severe or moderate disability on the HAQ scale and receive combination therapy. This type of therapy is administered when joint disease is very advanced, which naturally worsens their quality of life. Therefore, it can be stated that patients receiving monotherapy or who have undergone reconstructive

surgery have a better quality of life.

The choice of “Type of Treatment Received” is correlated with the “Degree of Joint Involvement DAS28”. This group includes the same patients mentioned earlier, who, as noted, have an unfavorable condition on the DAS28 scale and receive combination therapy.

A high correlation is observed between the “Time Elapsed from RA Diagnosis to Treatment Received” and “Comorbidity”, as well as with the “Duration of RA Disease”. The patients associated with these correlations are patients 4, 26, 27, and 28, who are characterized by long periods between diagnosis and treatment initiation and a longer duration of the disease. Additionally, most of them (75%) underwent reconstructive surgery and suffer from hypertension as a comorbidity.

“Quality of Life HAQ” and “Degree of Joint Involvement DAS28” are correlated with “Body Mass Index”. Overweight patients tend to have greater joint involvement and a poorer quality of life.

5. Discussion

The findings of this study suggest that reconstructive surgery can significantly improve the quality of life of patients with RA.

The results also showed a high correlation between the degree of joint involvement and the chosen treatment, where patients with more severe involvement received combination therapy or opted for reconstructive surgery. This suggests that surgery may be an effective option to improve function and appearance in patients with advanced RA. Previous studies have supported the efficacy of reconstructive surgery in patients with severe RA [14].

On the other hand, it was found that BMI correlates with both quality of life and degree of joint involvement. This result is similar to that reported by [15], who found that comorbidities played a preponderant role in patients’ perception of quality of life, and that overweight and obesity are important factors influencing quality of life. According to [16], obesity and overweight aggravate rheumatic diseases and reduce the effectiveness of therapies. In rheumatoid arthritis, studies have shown that obesity is a risk factor for the development of these diseases, as well as a negative impact on activity, quality of life, and response to treatments. Likewise, obesity itself, due to an increase in the production of cytokines in visceral adipose tissue, adds to the systemic inflammation affecting people with rheumatoid arthritis.

The longer the time elapsed since the diagnosis of RA until treatment is received, the more the quality of life deteriorates. This is consistent with previous studies that have found that delay in the treatment of RA is associated with poorer functional and quality of life outcomes [17] [18].

Although it is not a procedure free of complications, reconstructive surgery is an effective alternative in patients with rheumatoid arthritis, allowing joint function to be restored and pain to be reduced, with the consequent improvement in quality of life in the medium term [19].

One of the keys to the success of reconstructive treatments in patients with rheumatoid arthritis is the integration of interdisciplinary teams between different medical specialties, from diagnosis to long-term follow-up.

The limitations of the study are related to the sample size, because the caseload is not high, and rheumatology is not a priority within public health in Ecuador.

6. Conclusions

Patients with a high degree of joint involvement who receive combination therapy experience a worse quality of life.

Patients who underwent reconstructive surgery report a better quality of life. Reconstructive surgery plays an important role in the management of patients with advanced rheumatoid arthritis, helping to restore function and improve quality of life.

Patients who are overweight or obese are more likely to experience a deterioration in their quality of life and present with severe conditions of joint involvement.

Those who did undergo surgery improved their mobility and aesthetics and experienced a reduction in pain by removing the inflammatory components of the joints. Nevertheless, there are currently few candidates for this surgery, possibly due to cost or fear of undergoing surgical intervention, leaving this option almost exclusively for patients with a high degree of joint deformity.

In the future, prospective cohort studies with 5 - 10-year follow-ups are recommended to determine the durability of surgical results and the need for reinterventions.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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