

The impact of SARS-CoV-2 pandemic on Oncologic and Degenerative Spine Surgery Department activity: the experience of Rizzoli Orthopaedic Institute under COVID-19 lockdown

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Abstract. – **OBJECTIVE:** Experience of Department of Oncologic and Degenerative Spine Surgery of Rizzoli Orthopaedic Institute during SARS-CoV-2 pandemic lockdown.

PATIENTS AND METHODS: Retrospective observational study of surgically treated patients from 09th March 2020 to 04th May 2020. Data collected: age, sex, type of disease, neurological status, days of hospitalization, complications and type of discharge. A comparison analysis with same period of the last year was performed in order to evaluate the impact of COVID-19 spreading on daily surgical activity.

RESULTS: A total of 107 surgical procedures in 102 patients were performed from 09th March 2020 to 04th May 2020. Analysis showed a statistically significant difference in age, sex, ASIA class and type of treated disease compared to the same period of the last year ($p=0.042$, 0.006 , 0.022 and 0.007 , respectively). No statistically significant differences were observed in type of discharge, length of hospitalization and complications ($p= 0.447$, 0.261 and 0.127 , respectively). 3 COVID-19 infections have been identified in hospitalized patients. 1 COVID-19 patient was admitted from Emergency Department and was managed according to a dedicated path.

CONCLUSIONS: Surgical activity was paradoxically increased during SARS-CoV-2 pandemic lockdown through the management of urgent and non-deferrable spinal disease with a low rate (3,9%) of COVID-19 infections.

Key Words:

COVID-19, SARS-Cov-2 Pandemic, Spine Surgery, Orthopaedics, Spine oncology.

Introduction

The novel coronavirus firstly emerged in Wuhan, Province of Hubei, People's Republic of China, in December 2019^{1,2}. On 11th March 2020 the World Health Organization (WHO) declared the COVID-19 spreading as pandemic. In Italy, the first outbreak of infection was identified on 21th February 2020 in Codogno, Lombardia. Italy is one of the countries that has been most affected by the spread of COVID-19, reporting on 04th May 2020 with a number of infected and deaths of 211.938 and 29.079 people, respectively.

Since 21st February 2020, the assistance activity of our Orthopaedics Institute progressively changed through the suspension of the elective surgery and giving priority to urgent and emergency surgery and to non-deferrable surgery.

While the hospital overall reduced its activity³, the Department of Oncologic and Degenerative Spine Surgery passed from having two operating sessions a week and three every other week to having an operating session every day from Monday to Friday. The productivity of our Department paradoxically increased in this period compared to the same period of the last year.

This paper would report the experience of Department of Oncologic and Degenerative Spine Surgery of Rizzoli Orthopaedics during pandemic through the retrospective analysis of clinical data of surgically treated patients and to show

how the containment measures adopted in our Institute have allowed to increase the level of activity with a limited spread of infection.

Patients and Methods

A retrospective observational study of surgically treated patients from 09th March 2020 to 04th May 2020 at Department of Oncologic and Degenerative Spine Surgery of Rizzoli Orthopaedic Institute was carried out. For each patient the following data were collected: age, sex, type of disease, neurological status, days of hospitalization and complications. Type of discharge was assessed evaluating if whether they have been discharged at home, in a rehabilitation facility or if they have been transferred to Intensive Care Departments.

During hospitalization, all patients were monitored for symptoms of COVID-19 infection⁴. Fever, cough and wheezing were considered alarm symptoms and according to their appearance, a lung HRCT was performed. Alteration of blood test, such as leukopenia, lymphopenia and an increase of PCR, SatO₂ <94% and a decreased pO₂ on blood gas analysis were alarm parameters that indicated the execution of lung HRCT. A swab for COVID-19 research was performed for patients with a HRCT suggestive of interstitial inflammatory disease. If negative a second swab was carried in order to increase diagnostic accuracy. Patients who tested positive were isolated in a special hospital section dedicated to COVID-19 positive patients.

In order to evaluate the influence of COVID-19 spreading on daily clinical practice, a comparison of the examined variables was performed with the same period of the last year.

Results

From the 9th March to 04th May 2020, 102 patients (59 males and 43 females) with a mean age of 55.7 years old (range 10 - 93) underwent a surgical procedure at our department. 51 patients (50%) were treated for an oncological disease⁵⁻⁷; 35 patients (34.3%) for a degenerative disease; 10 patients (9.8%) for vertebral fractures⁸; 7 patients (6.9%) for spine infection^{9,10}. Evaluation of neurological status was performed with the American Spinal Injury Association Scale. 66 patients (65%) were classified as ASIA E and 36 patients had an

ASIA scale <E (34 ASIA D and 2 ASIA C). 12 were admitted from the Emergency Department, the remaining ones from the attending list. In 72 patients, treatment was non-deferrable (surgery must be performed within 30 days from the visit); in 18 patients, the level of priority changed for the worsening of clinical symptoms and the worsening of neurological function, so treatment that at the moment of the visit was considered deferrable began non-deferrable.

A total of 107 surgical procedures were performed in 102 patients. Three patients needed revision surgery for complications (two revisions for screw malplacement, one associated with hardware infection, and one revision for post-surgical hematoma in cervical decompression). One patient, for a changing in the therapeutic plan, received a further surgery as widely explained in the discussion. In a case surgery was stopped for the appearance of intraoperative tachyarrhythmia and completed 6 days later.

In our series, nine patients referred alarm symptoms and were submitted to HRCT. Of them, seven patients had CT scans suggestive for interstitial inflammatory disease. Two patients had swabs positive for COVID-19 and were transferred to COVID-19 section. One patient without symptoms tested positive for swab in the Post-Operative Intensive Care Unit and was transferred to an Intensive Care Unit for COVID-19 patients.

One patient with an increasing neurological deficit from T4 metastatic epidural cord compression and a positive swab was admitted from the Emergency Department to be submitted to a urgent procedure of decompression, debulking and stabilization. After surgery, he was isolated in COVID-19 section of the Hospital until negativity of two consecutive swabs.

The mean hospitalization length was 10.7 days (range 2-31). 90 patients were discharged home, 21 in a rehabilitation facility and one death was observed. A total of 34 complications in 27 patients were observed. 10 intra-operative complications and 24 early postoperative of which 15 systemic with one death and 9 surgery-related with 2 hardware infections.

In the same period of the last year, 69 patients (25 males and 44 female) were admitted to our Department of Surgical Procedure. 25 patients (36.2%) were treated for oncological disease; 21 patients (30.4%) for a degenerative disease; 20 patients (29%) for vertebral fracture and 3 patients (2.9%) for spine infection. 57 patients (82.6%) were evaluated as ASIA E, 10 patients

(14.5%) as ASIA D and 2 patients (2.9%) as ASIA C. The mean length of hospitalization was 11.52 days (range 2-72). 58 patients (84%) were home discharged and 11 ones (16%) in a rehabilitation facility. A total of 17 complications in 12 patients were observed with 2 intraoperative complications and 15 early postoperative complications (7 systemic and 8 surgery-related with 4 hardware infections).

Statistical Analysis

Statistical analysis showed a statistically significant difference in age, sex, ASIA class and type of treated disease between the two series ($p=0.042$, 0.006 , 0.022 and 0.007 , respectively). No statistically significant differences were observed in type of discharge and length of hospitalization ($p= 0.447$ and 0.261 , respectively). As regards complications, no statistically significant difference was found in the number of patients with one or more complications ($p=0.127$), absolute number of complications ($p=0.223$) and intraoperative, systemic and surgery-related complications (0.238).

Features of two series and results of comparison analysis are reported in Table I.

Discussion

Italy was the first country in Europe to suffer SARS-Cov-2 pandemic. Hospitals have gradually adapted through implementing Intensive Care Unit (ICU) places and reducing their daily elective activities (surgical and otherwise).

The Department of Oncologic and Degenerative Spine Surgery of Rizzoli Orthopaedics Institute deals with the treatment of oncological, infectious and degenerative spine disease through interventions that are planned in the election regime.

The 09th March 2020, date of the start of lockdown in Italy, coincided with the day in which the Institute formally suspended the elective surgery guaranteeing the surgical activity for emergency/urgency procedures and for non-deferrable surgery. Paradoxically, surgical activity of our Department has increased compared to the same period of the last year, since patients with oncological vertebral pathology and/or degenerative disease with functional and neurological deficit cannot postpone their treatment course.

Since 21st February, the Hospital immediately adopted measures to contain pandemic through personal protective equipment (PPE) protocols

Table I. Clinical features and results of 2019 and 2020 analyzed series.

	2019 (n = 69)	2020 (n = 102)	p
Mean age (years old)	61.59	55.57	0.042*
Sex	25 M/44 F	59 M / 43 F	0.006^
ASIA			0.022^^
E	57	66	
D	10	34	
C	2	2	
Disease			0.007^^
Oncologic	25	51	
Degenerative	21	35	
Fracture	20	9	
Spine infection	3	7	
Discharge			0.447^^
Home	58	90	
Rehab facility	11	11	
Death	0	1	
Mean hospitalization length (days)	11.52	10.07	0.261*
Patients with one or more complication	57 (82.6%) No 12 (17.4%) Yes	74 (73.5%) No 28 (26.5%) Yes	0.127^
Absolute number of complications	17 out of 69 surgical procedures	34 out of 102 surgical procedures	0.223^
Type of complication			0.238^^
Intra-operative	2 (2.9%)	10 (9.8%)	
Systemic	7 (10.1%)	15 (14.7%)	
Surgery-related	8 (11.6%)	9 (8.8%)	

*2-tailed *t*-test; ^2-sided Pearson chi-squared test; ^^2-sided Pearson chi-squared test for independence.

and social distancing rules. All health-care workers were equipped with surgical masks or N95 mask, protective glasses, cap, gown and gloves. Patients were invited to use the surgical mask and relatives' visits were allowed to a single person with mask at certain times. Social distancing was also achieved by reducing the number of patients per room to one maximum three. All health-care workers were screened with swabs and periodic serological tests. A special hospital section for COVID-19 patients and a dedicated operating room have been established.

Daily practice focused on the research of COVID-19 positive and symptomatic patients in order to contain the infection. The first step was to identify patients to submit to swab. From 21st February to 08th March, when the virus was confined to Northern Italy, the criteria for identifying suspected clinical cases were origin from endemic geographical areas and the appearance of clinical symptoms. Since 09th March, date of lockdown advent, symptoms have been considered the only criterion for performing swabs.

Since 10th April, clinical activity has changed the search for asymptomatic patients for which the execution of swab was established two to three days the admission to department. For patients admitted from Emergency Department, a swab was performed immediately performed and patients were invited to stop in a filter area pending the outcome.

These measures, gradually adopted, have led to the identification of 3 hospitalized patients with COVID-19 infection and one patient admitted to Emergency Department for T4 metastatic epidural spinal cord compression with increasing neurological deficit.

Comparison between the series showed a statistically significant difference in sex and age of patients. These results can be explained with the significant reduction in Percutaneous Vertebroplasties (PVPs) performed for osteoporotic fractures. In 2019 series, 19 PVPs out of 69 patients (27.5%) were performed for osteoporotic vertebral fractures and 18 of 19 patients were female. Instead, in 2020 series, 13 PVPs out of 102 patients (12.7%) were performed. Of these 13 cases (8 males and 5 females), only 8 PVPs were performed for osteoporotic vertebral fractures, the remaining ones for oncological disease. This data is in line with the desire to avoid subjecting to surgery elderly patients more susceptible to serious forms of COVID-19 infections, treating them conservatively, where possible. Of patients

with osteoporotic fractures, only those ones with intractable pain were operated.

COVID-19 spreading influenced daily practice also in term of treated disease, length of hospitalization and type of discharge in comparison with the same period of the last year. In 2020 series, most of patients were cancer patients who cannot postpone their surgical treatment. Although there are no statistically significant differences in term of length of hospitalization and type of discharge, in 2020 series length of hospitalization was 1.45 days shorter. Patients with a more complex pathology and with a higher rate of complications were treated and efforts were made to maintain a low hospitalization duration and to discharge patients at home, avoiding facilities that could be potential sources of infection. At the same time, there was no statistically significant increase in complication rate despite the fact that patients at greater risk of complications were operated.

In one patient, therapeutic process was influenced by the spread of pandemic. A sixty-one years old man was admitted for T9 a renal cell carcinoma metastasis with epidural spinal cord compression and worsening of neurological function and he was submitted to decompression, debulking and stabilization. His plan was to perform radiation therapy in order to achieve local disease control. The spread of pandemic did not allow carrying out radiotherapy in short time, so patient was submitted to T9 corpectomy by anterior approach. Left nephrectomy was also performed in the same operating session since the primary tumour had not yet been treated. This emblematic case raised a question: did COVID-19 spreading influence the therapeutic path of cancer patients? Unfortunately, given the short follow-up considered until the date of discharge, currently it is not possible to give a definitive answer. This topic will be the subject of a forthcoming paper.

Conclusions

Thanks to the measures adopted to contain pandemic, it was possible to increase the surgical activity of the Department, allowing treating patients with urgent or non-deferrable disease and obtaining a very low rate of COVID-19 infections.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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