Palliative Reconstructive Surgery for Advanced Maxillofacial Osteosarcoma in the Peak of COVID-19 Pandemic: A Matter of Ethical Decision-making

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Summary: The coronavirus disease 2019 posed an unprecedented strain to plastic surgery services. The scarcity of validated guidelines—at the beginning of this healthcare crisis—to direct clinical, ethical, transparent decision-making for head and neck cancer patients requiring palliative reconstructive surgery was a difficult situation. We report a 15-year-old girl with an advanced chemoresistant radiotherapy-induced mandibular osteosarcoma during the early phase of the pandemic in the United States in mid-March 2020, when official recommendations for triage were still developing. Local guidelines suggested canceling all elective procedures, and allowed operating emergency and/or nonelective cases only. Many surgeons declined surgery due to patient’s poor prognosis and high perioperative risk, but her mother pursued different professional opinions elsewhere. However, upon Beaumont hospital approval, the patient underwent radical en bloc resection of the tumor, hemimandibulectomy, zygomatic resection, maxillectomy, and hemipalate resection followed by reconstruction with free fibula osteocutaneous and anterolateral thigh flaps. The challenging decision to proceed with surgery was based on evidence-based and objective risk-stratifying scores, available at the time, and ethical recommendations from emerging reliable published literature. Despite a favorable postoperative outcome, the patient expired due to cardiac complications of the disease. Our patient taught us that ethical decision-making, sound clinical judgment, and a patient-centered individualized approach remain pivotal aspects of the medical profession. Although the surgery will not provide a cure for the disease, we have found that palliative reconstructive surgery can greatly improve patient’s quality of life, and help family cope with the advancing stages of disease. (Plast Reconstr Surg Glob Open 2021;9:e3545; doi: 10.1097/GOX.0000000000003545; Published online 29 March 2021.)

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic posed unprecedented challenges for the healthcare system including plastic and reconstructive surgery services. There was a lack of a unified framework to direct decision-making, especially for head and neck cancer patients requiring palliative reconstructive surgery. The guidelines issued in the early phase of the pandemic—based only on expert opinion—were ambiguous and too general, without considering ethical issues in a patient-centered model of care. However, more robust and objective recommendations were published by several institutions to provide a more transparent care pathway.1–8

CASE REPORT

Outside-hospital Treatment

We present a technically demanding, ethically challenging case of a 15-year-old girl who was diagnosed with a left orbital rhabdomyosarcoma in 2008 at the age of 2 years old. Initially, the patient was successfully treated...
with chemotherapy (anthracyclines) and radiation. After 2 years, she underwent a left orbital exenteration and reconstruction with a free transverse rectus abdominis muscle flap (TRAM) due to multiple recurrences of the tumor despite intermittent chemotherapy sessions.

In November 2018, she was diagnosed with metastatic chemoresistant radiation-induced osteosarcoma (RIOS) of the mandible. A relatively stable metastatic lesion was found in the right femur on further investigations. Due to exponential growth of the tumor, which pressed against the upper aerodigestive tract, the patient was unable to tolerate oral solid food. In addition, she developed anthracycline-induced cardiomyopathy (Table 1). The treating team recommended nonoperative palliative treatment only. The patient’s mother pursued professional opinions elsewhere.

Preoperative Planning during COVID-19 Pandemic

On March 16, 2020, an emergency state was declared in the United States due to COVID-19, by which “all elective surgeries were canceled and only emergencies were allowed.” The patient was assessed for the first time in our department the following day. On physical examination, an exophytic massive tumor was protruding from the patient’s mouth, causing difficulty breathing (Fig. 1). She was otherwise an active child with an age-appropriate behavior.

A preoperative 3-dimensional computerized tomography showed a locally destructive lesion of the left ramus and body of the mandible. The oropharynx was almost completely occluded due to mass effect. After multidisciplinary team meetings and thorough discussions with the mother explaining the palliative nature of the operation and the increased perioperative morbidity and mortality, an informed consent was obtained to proceed with tumor resection and reconstruction. Preoperative cardiological and anesthetic optimization of the patient followed. A nonelective surgical tracheostomy was performed followed by interventional radiology embolization due to high vascularity around the tumor.

Reconstructive Surgeries

With all protocols in place for high-risk anatomic regions (personal protective equipment and pressure-controlled operating room (OR)), the patient underwent radical en bloc resection of the osteosarcoma, left hemimandibulectomy, zygomatic resection, maxillectomy, and hemipalate resection, performed by the senior author (K.C.) (Fig. 2). After negative margins were confirmed by frozen section intraoperatively, a complex maxillofacial reconstruction was performed with 2 free flaps: fibula osteocutaneous flap for mandibular reconstruction and anterolateral thigh for resurfacing (Figs. 3 and 4). On the seventh postoperative day, she developed venous congestion of the anterolateral thigh flap managed with anastomosis revision and leech therapy. Two weeks postoperatively, she started an oral diet and was discharged home. She reported improved quality of life (QoL), being able to enjoy food again.

After 4 weeks, a surgical debridement and salvage reconstruction with a free radial forearm flap was performed due to dehiscence of the fibula skin paddle leading to fistula formation. The decision was justified because an autologous flap reconstruction was necessary for coverage of exposed hardware, bone, and vital organs and structures.

The patient had an uneventful recovery and was discharged on the eighth postoperative day. Eight weeks later, she was readmitted to the pediatric intensive care unit with dyspnea. During hospitalization, she had a cardiac arrest. After extensive cardiopulmonary resuscitation efforts, the pediatric intensive care unit team achieved return of spontaneous circulation. She never regained consciousness, and died after 3 days (Table 2).

DISCUSSION

In our case, the decision-making process was challenging as a unique ethical dilemma emerged; a vibrant pediatric patient with an expanding metastatic chemoresistant mandibular osteosarcoma with impending airway obstruction required palliative surgery during an unprecedented

Fig. 1. Preoperative frontal view of the patient with a massive recurrent osteosarcoma of the left mandible.

Fig. 2. Intraoperative specimen of the radical en bloc resection of the tumor with a 3-dimensional printed model.
healthcare crisis. Many surgeons from elsewhere previously declined treatment for this patient due to poor prognosis and high surgical risk. However, our patient and her family looked to our team not for a cure of the disease, but an improvement of her quality of remaining life.

A multidisciplinary team comprised of a pediatric cardiologist, pediatric intensivist, interventional radiologist, and plastic surgeon met with the patient and the family. The main concern was her ability to tolerate the proposed surgery with anthracycline-induced cardiomyopathy. After discussion of risks with the treatment team and family, it was ultimately decided to proceed with surgery. The patient had been admitted to the hospital for preoperative planning and cardiac optimization. Due to the COVID-19 pandemic, there were multiple restrictions on surgical procedures due to increased risk of transmission, inpatient capacity of the institution, patient flow, and utilization of resources. Each surgery to be performed needed the approval of the hospital chief of surgical services on the review committee. Given the aggressiveness of the tumor growth and increasing risk to life, our patient met hospital review committee and local government guidelines for head and neck cancer requiring complex reconstruction.

A medically necessary, time sensitive procedure was warranted because any delay in treatment would threaten the patient’s life by deterioration of the symptoms. During the COVID-19 pandemic, 3 major categories had to be considered: surgical risk (anticipated outcome), viral transmission risk to personnel, and degree of resource utilization. The calculated medically necessary time sensitive score was 59; thus, reserved operating room capacity for emergent/urgent cases was justified. Although the patient succumbed to cardiac complications related to treatment of her malignancy, her self-reported QoL was improved.

Table 1. Summary of Out-of-hospital Treatments and Operative Interventions

| Timeline (y) | Patient Age (y) | Diagnosis               | Type of Intervention and Reconstructive Surgery | Outcomes                      |
|-------------|----------------|-------------------------|-------------------------------------------------|-------------------------------|
| 2008        | 2              | Orbital rhabdomyosarcoma| Chemotherapy (first round), radiation            | Transient tumor regression    |
| 2010        | 4              | Tumor recurrence        | Chemotherapy (second round)                      | Transient tumor regression    |
| 2011        | 6              | Tumor recurrence        | Orbital exenteration-free TRAM                  | Successful                    |
| 2018        | 13             | Metastatic RIOS         | Chemotherapy                                    | Failed response—AIC           |

AIC, anthracycline-induced cardiomyopathy; RIOS, radiation-induced osteosarcoma; TRAM, transverse rectus abdominis muscle.

Fig. 3. Intraoperative image of the free fibula osteocutaneous flap and free anterolateral thigh flap for mandibular/buccal mucosa reconstruction and cheek resurfacing, respectively.

Fig. 4. Immediate intraoperative photograph of the reconstruction after closure of the surgical wounds.
CONCLUSIONS

Our patient taught us that ethical decision-making, sound clinical judgment, and a patient-centered individualized approach remain pivotal aspects of the medical profession. Although the surgery will not provide a cure for the disease, we have found that palliative reconstructive surgery can greatly improve patient QoL and help families cope with the advancing stages of disease.

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PATIENT CONSENT STATEMENT

The patient’s family provided written consent for the use of her image.

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