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***From the Editor***

Dear id health science readers...

We are very pleased with the interest in our journal. We would like to thank the scientists who are following our journal and make their valuable criticism and advice. In the following issues, we will reach our readers with a much wider index network. Kindest regards...

Id health science is an open-access and peer-reviewed academic journal for the publication of scientific articles on all health sciences. Id health science accepts original research articles, reviews, and case reports for publication. Id health science accepts articles from all areas of health sciences. All articles to be published in the id health science are peer-reviewed without delay and are published online for immediate access and citation after the publication process is completed. Id health science is published three times a year (February, June and October).

Editor-in-Chief  
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## OSTEOARTHRITIS IN SMALL ANIMALS

Büşra KIBAR KURT<sup>1\*</sup>, Ahmet GÜRSEL<sup>2</sup>, İlker ŞEN<sup>3</sup>

### ABSTRACT

#### Keywords

Cat,  
Dog,  
Degenerative arthritis,  
Osteoarthrosis,  
Osteophyte

*Osteoarthritis (OA) is a chronic disease that causes gradual damage to the joints. This disease causes problems such as pain, decreased mobility, and a decrease in overall quality of life. Regular check-ups are important for early detection of OA. Treatment options include pain management, slowing disease progression, increasing joint stability, and restoring normal joint function. Although there is no specific treatment for OA, a multimodal treatment approach is used. This treatment usually includes a combination of different modalities such as pharmacological interventions, surgical procedures, weight loss and physiotherapy.*

### INTRODUCTION

Osteoarthritis (OA) can be defined as a disorder of the joints characterized by deterioration of the articular cartilage. There is osteophyte formation in the joints, bone remodeling, changes in the periarticular tissues, and inflammation of varying severity<sup>1</sup>. Inflammatory arthritis includes immune-mediated or infectious causes. rheumatoid arthritis is considered more severe, progressive, and debilitating compared to osteoarthritis. Although osteoarthritis may limit normal function in severe cases, rheumatoid arthritis is recognized as a primary immune-mediated systemic condition with greater aetiological significance<sup>2-4</sup>.

OA is a complicate disease and it is often misunderstood that it is only in cartilage. It is a disease involving the hyaline cartilage, synovial membrane, synovial fluid, subchondral bone and surrounding supporting tissues (muscle and ligament) in the joint. The joint can be considered as an organ with all the structures it contains<sup>4</sup>.

Osteoarthritis is a degenerative condition that primarily affects movable joints. It is often caused by trauma, either abnormal force on a normal joint or normal force on an abnormal joint. Prolonged and vigorous use of normal joints does not typically lead to osteoarthritis, but abnormal joints are more susceptible to its development. Other less common causes in animals include metabolic, endocrine, and genetic disorders. Regardless of the cause, there is a common pathway leading to the breakdown of articular cartilage, subchondral bone, synovium, and joint capsule. Treatment of osteoarthritis requires a comprehensive understanding of the involved anatomy, physiology, and pathology<sup>3</sup>.

OA is not a normal form of aging. Various methods have been developed in veterinary medicine to detect most diseases at an early stage. In fact, with the anatomical locations and predisposing factors, it is a specific disease<sup>5</sup>. Laxity, inconsistency, weight bearing variability, and joint damage increases OA predisposition by creating abnormal stress and chronic inflammation in the articular cartilage<sup>6</sup>.

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OA is classified as idiopathic (primary) or secondary. It usually occurs secondary to the developmental anomaly, joint instability or trauma (hip dysplasia, osteochondritis dissecans, cruciate ligament rupture) in dogs<sup>7</sup>. Many factors increase the susceptibility to osteoarthritis. Systemic factors such as genetics, age, and obesity determine individual susceptibility.

### **Etiology**

Idiopathic and generalized osteoarthritis is common and inherited. Many genetic factors can affect the incidence and severity of OA. Joint structure, gender and breed can affect it in different ways. Depending on gene diversity, susceptibility to OA may increase and even some genes alone can be effective in this regard<sup>8,9</sup>.

It is known that age is effective in the formation of osteoarthritis. Aging affects joint structures, including cartilage tissue. The structure of normal articular cartilage is water, Type II collagen, aggrecan (respectively: 65-80%, 10-20%, 4-7%). In addition to these macromolecules, there are 5% small molecule proteoglycans, collagens, protein, fibronectin and lipids. With aging, chondrocytes are less synthesized, aggrecan molecules begin to lose their homogeneity, mitotic and synthetic activities, anabolic mechanical stimulants and growth factors decrease. As time passes, the cartilage gradually deteriorates, leaving the subchondral bone exposed and prompting its regenerative efforts to repair the damaged tissue. This leads to heightened bone density in the affected area and an uneven restructuring of the joint surface. Additionally, the formation of thick bony outgrowths known as spurs may occur. Consequently, the joint's ability to articulate becomes challenging. These changes are further exacerbated by a decrease in synovial fluid, which normally serves as a natural lubricant and cushion for the joint<sup>10-12</sup>.

There is no clear information about a definite relationship between weight and osteoarthritis, but the risk of developing diseases that cause OA, such as hip dysplasia, increases depending on weight gain. Cruciate ligament rupture is especially more common depending on the increase in weight. Obesity is a risk factor for OA<sup>13</sup>.

Studies have shown that in male and female animals, anterior cruciate ligament rupture causing OA is at the same level. According to a study, male dogs were found to have 1.47 times higher odds of developing elbow joint disease compared to females. Neutered dogs had 1.69 times higher odds of elbow joint disease compared to intact (non-neutered) dogs<sup>14</sup>.

The initial onset of OA is believed to be caused by an imbalance between cartilage degradation and repair<sup>15,16</sup>. The specific events that trigger the disease are a topic of debate. One hypothesis suggests that pro-inflammatory cytokines released into the joint lead to the production of matrix metalloproteinases, which break down the cartilage matrix, resulting in bone remodelling and synovitis<sup>17-19</sup>. However, studies propose that synovitis and subchondral bone remodelling occur before articular degeneration in the early stages of OA<sup>20,21</sup>. Another theory suggests that meniscal degeneration, characterized by tissue fibrillation and reduced collagen levels, contributes to the progression of OA<sup>22,23</sup>. In later stages, osteophytes, subchondral cysts and sclerosis form as a direct consequence of cartilage degradation, bone remodelling, and synovitis<sup>24,25</sup>.

Joint fractures, elbow and hip dysplasia, rupture of the cranial cruciate ligament (CCL), and joint instability because of trauma or angular limb deformity are predisposing factors. In disease processes affecting the joint, there is a permanent state of inflammation in the affected joint. In long-lasting inflammation, the body responds by trying to stabilize the area through the formation of new bone. This leads to the development of OA. Arthritis can also affect joints along the vertebral column. In some cases, for example, hip dysplasia and spondylosis are the same, and their clinical manifestations may be similar. If only hip dysplasia is detected and spondylosis is overlooked, clinical symptoms may not decrease. Therefore, it is important to look for pain and signs of spondylosis (spinal degeneration) in the cervical, thoracic and lumbar spinal segments, as well as in the thoracolumbar and lumbosacral junctions<sup>5</sup>.

### **Diagnosis**

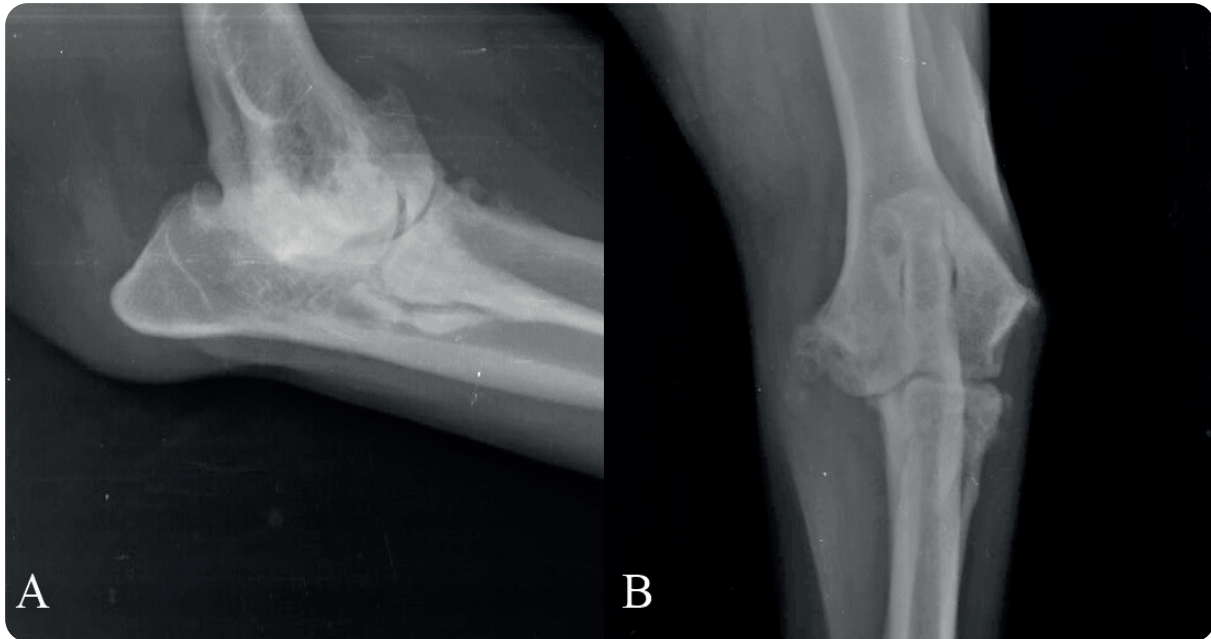
Instability, uneven load bearing, and joint injury lead to abnormal stress on the intra-articular cartilage and the development of chronic inflammation, resulting in osteoarthritis. OA-related symptoms; pain, swelling, stiffness and crepitation of the affected joints are often reported as decreased joint function or limited range of motion<sup>5</sup>.

Regular check-ups and pain assessments are important to detect and intervene in the development of pain and arthritis early. Often animals with OA can adapt to the condition and compensate for their pain, so a thorough examination is necessary to identify the source of the discomfort. A thorough physical examination

helps locate the source of the pain. For this, an orthopedic and neurological evaluation may be useful <sup>5,26</sup>.

The diagnosis of OA can be supported by history, orthopedic and neurologic examination findings, cytology, or imaging. Physical examination signs of arthritis are not specific to OA and need to be combined with further diagnostics and patient

history. Radiographs can show various signs of OA depending on its severity, including fluid accumulation, osteophytosis, and subchondral sclerosis (Figure 1). Researchers have explored the use of biochemical markers for diagnosing arthritis before clinical signs appear or predicting disease progression, but practical clinical applications of these markers have been limited so far <sup>5,26,27</sup>.



*Figure 1. Anteroposterior (A) and mediolateral (B) projections of a mix dog elbow with marked degenerative joint disease. Osteolysis and periarticular new bone formation are present.*

It is also important to understand the underlying cause of pain in aging animals and to exclude other potential diseases such as septic synovitis, osteosarcoma, bursitis, osteomyelitis and tendinitis/tendovaginitis. History and physical examination are helpful in the differential diagnosis of some diseases <sup>5</sup>.

The clinician's role in diagnosing OA is not just about recognizing the disease but also about ruling out other possible causes. Many animals may have OA in one or more joints. However, determining whether OA is the primary source of clinical symptoms can sometimes be challenging. A thorough physical examination is crucial in eliminating the possibility of other problems <sup>5,26</sup>.

In some cases, the presence of arthritic changes is evident and it is clearly the cause of the patient's issues. However, it's important to differentiate between different types of arthritis, such as immune-mediated arthritis or infectious arthritis, as they require different management approaches. Patient history and signalment (patient characteristics like age, breed, etc.) may be sufficient for making a diagnosis. Additional

diagnostic steps involve evaluating the joint fluid through cytologic examination, specifically looking at the number and type of nucleated cells present. Generally, OA is considered a "noninflammatory" arthritis because of the cell types found in the joint fluid. Animals with OA typically have elevated cell counts but lower than 5000 cells/mL. The fluid in OA primarily contains mononuclear cells, while inflammatory arthritides have primarily polymorphonuclear cells <sup>5,26,28</sup>.

Radiography is a very good method for imaging joints and bones <sup>29,30</sup>. To see the difference between normal and abnormal joint structures, radiography details, sharpness and contrast must be good. While high-quality radiographs provide maximum information, poor-quality radiographs are open to misinterpretation <sup>31,32</sup>. Radiographic examination plays a very important role in the diagnosis of OA. Radiography can reveal bone changes in and around the joint. In addition, it can rule out other abnormalities that may be indicative of diseases other than OA, such as excessive bone destruction, bone proliferation, or suspicious findings of other diseases <sup>5</sup>.

Tomography is a better imaging tool than radiography for early diagnosis. Transversal images are taken from multiple anatomical planes so that changes in the joint can be detected by three-dimensional analysis. Magnetic resonance

imaging (MRI) is superior to tomography in imaging periarticular and intraarticular soft tissues. Compared to radiography, new bone formations and bone destruction are displayed in more detail on tomography (Figure 2 and 3) <sup>33,34</sup>.

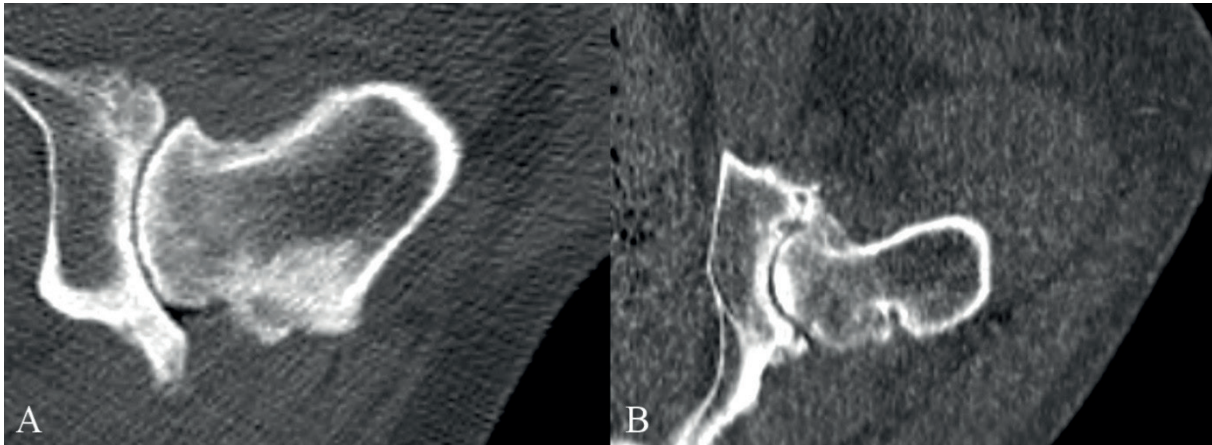


Figure 2. Transversal (A) and dorsal (B) right pelvic CT image of 11 years old Kangal with marked osteoarthritis. diffuse sclerosis of the caput femoris and acetabulum.



Figure 3. Transversal pelvic CT image of 7 years old, male, Golden Retriever. bilateral hip dysplasia and moderate osteoarthritis at acetabulum. R: Right, L: Left.

MRI has been established as a reliable non-invasive method for assessing cartilage in osteoarthritis, supported by studies. It is potentially capable of detecting early degeneration using high-resolution techniques <sup>34,35</sup>.

**Treatment**

OA is a lifelong condition that cannot be cured but can be effectively managed. The management approach depends on the severity and location of the disease. Clinicians can guide the therapy by considering factors such as pain, normal

activities, mobility, pet owner's goals. Establishing a pyramid of pain management, joint protection, nutritional support, and strengthening can be a natural progression in managing OA.

Surgical or conservative methods may be preferred in the treatment of OA. Surgical management aims to address the primary cause or perform salvage procedures. Weight control, physical therapy, and medications are components of conservative management. Specific protocols for conservative management may vary based on the animal's needs and the owner's abilities or preferences <sup>36,37</sup>.

Surgical options are most effective in the early stages of the OA, such as repairing torn ligaments or treating conditions like osteochondrosis, hip dysplasia, elbow dysplasia, articular fractures, and growth deformities.

Surgical options are most effective in the early stages of the OA, such as repairing torn ligaments or treating conditions like osteochondrosis, hip dysplasia, elbow dysplasia, articular fractures, and growth deformities. However, if the disease has progressed significantly, surgery may still be performed to alleviate symptoms, but the patient will likely have signs consistent with OA <sup>38</sup>.

Salvage procedures can also be performed surgically to relieve the arthritis symptoms. These procedures involve eliminating the affected joint or limb, ranging from simple procedures like excision arthroplasty to more complex ones like joint replacement or arthrodesis. The clinical outcomes of these treatments can vary and can be performed at any stage of the disease. Surgical procedures may be preferred when conservative treatment is unsuccessful <sup>39</sup>.

Weight loss is crucial in managing OA. Overweight is a common issue in small animals and a significant risk factor for the development of OA. In older dogs, obesity can also increase the injuries such as damage to the CCL. Excess weight adds strain to already painful joints and contributes to chronic inflammation throughout the body. Adipose tissue, or body fat, is proinflammatory and produces active cytokines. Animals with excessive body fat are more likely to be inactive, and this chronic inflammatory state negatively affects joint health. Research has demonstrated that reducing caloric intake and achieving weight loss can decrease the clinical signs of OA and improve mobility <sup>36,37,40</sup>.

A study mentioned the benefits of exercise in reducing joint pain, particularly supervised aerobic exercise performed at least three times a week <sup>41</sup>. Swimming has also shown positive effects on joint function in dogs with OA <sup>42</sup>. However, these therapies may not be readily accessible or affordable for all dog owners, particularly those with mild OA. Walking and running exercises have shown benefits similar to aquatic therapy in humans and are more accessible for dogs. A tailored exercise prescription based on the severity of OA in dogs may be necessary, and activity monitors can help veterinarians understand the animal's activity patterns and make exercise recommendations <sup>43</sup>.

Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used for the treatment of OA due

to their effectiveness in relieving pain and their ease of administration. Multimodal therapy, combining pharmacologic and nonpharmacologic approaches, is often recommended for the complex nature of pain in OA. It is suggested to use the lowest effective dose of any drug, especially when it is a part of multimodal therapy, to minimize potential side effects <sup>3</sup>. NSAIDs such as carprofen, etodolac, deracoxib, meloxicam, tepoxalin, and firocoxib can be used for OA management. The analgesics such as tramadol, amantadine, gabapentin, and others can be used in multimodal treatments <sup>3,44,45</sup>.

## CONCLUSION

OA is a chronic disease that causes gradual damage to the joints, causing pain, decreased mobility, and a decline in overall quality of life. Regular examinations are important for early diagnosis of the disease. There is no certain treatment for OA, multimodal treatment options aim to manage pain, slow disease progression, increase joint stability and restore normal joint function. These treatment approaches typically include a combination of modalities such as pharmacological interventions, surgery, weight loss and physiotherapy.

## Conflict of interest statement

The authors declare that they have no conflicts of interests.

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None.

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## NURSING MANAGEMENT IN PATIENTS UNDERGOING PLASTIC AND RECONSTRUCTIVE BREAST SURGERY

Bircan KARA<sup>1\*</sup>, Senem GÜNEŞ KARA<sup>2</sup>

### ABSTRACT

#### Keywords

Plastic surgery,  
Breast Surgery,  
Breast Reduction

Human beings are holistic entities with biopsychosocial aspects. Any intervention targeting one aspect of this whole has an impact on the individual's physical, psychological, and social well-being. Physical health and beauty hold great importance for individuals throughout history. Plastic reconstructive surgery involves the surgical treatment of congenital or acquired deformities affecting almost all externally visible parts of the human body, as well as the repair of open wounds, reattachment of severed parts, reconstruction of missing parts, and treatment of tumors located in the skin and subcutaneous tissue. It also includes various aesthetic surgical procedures aimed at enhancing appearance, commonly known as aesthetic or plastic surgery. While each surgical procedure presents its own unique challenges, interventions that alter physiological functions and disrupt body integrity, ultimately affecting one's lifestyle, can threaten body image and self-esteem. Particularly after breast surgery, both psychological and physiological issues may arise. In addressing these problems and preserving the biopsychosocial integrity of the patient, the role of nurses is crucial. The postoperative care of individuals should adopt a holistic approach and involve both the individual and their family. Care for individuals undergoing surgery should be planned in three stages: preoperative, intraoperative, and postoperative care. The implementation of care designed to facilitate the return of individuals to their normal lives should be personalized and tailored to the specific needs of each patient. Therefore, nurses should assess patients individually and plan nursing care accordingly, encompassing the preoperative, intraoperative, and postoperative phases.

### INTRODUCTION

Human beings are holistic entities with biopsychosocial aspects. Any intervention targeting one aspect of this whole has an impact on the individual's physical, psychological, and social well-being. The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." Disease, on the other hand, refers to a medical condition that involves physiological and organic processes, affecting the individual's life in terms of physical, psychological, psychosocial, intellectual, and social dimensions<sup>1</sup>. Diseases can temporarily or permanently disrupt an individual's adaptation due to functional impairments caused by various reasons. Individuals may develop different emotional responses and adjustment problems in response to illness<sup>2</sup>. Emotional responses and adjustment disorders to illness can vary depending on factors such as individual's personality structure, physical and psychological condition, support from the environment, the magnitude and type of illness or loss, the approach of the healthcare team, and the individual's mental preparedness<sup>1,2</sup>.

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Physical health and beauty hold great importance for individuals throughout history. Plastic reconstructive surgery involves the surgical treatment of congenital or acquired deformities affecting almost all externally visible parts of the human body, as well as the repair of open wounds, reattachment of severed parts, reconstruction of missing parts, and treatment of tumors located in the skin and subcutaneous tissue. It also includes various aesthetic surgical procedures aimed at enhancing appearance, commonly known as aesthetic or plastic surgery. The term "plastic" refers to reshaping something<sup>3</sup>. This reshaping process can involve improving the appearance or correcting a faulty bodily function in most cases. The term "reconstructive" refers to rebuilding or restoring. It is one of the main concerns of plastic surgery to reconstruct a lost organ or organ part due to various reasons (reconstruction) or create a non-existent organ (construction). Another term that defines the specialty is "aesthetic," which is associated with beauty<sup>4</sup>. In aesthetic surgeries, the goal is to transform the appearance of a body part that is normally considered normal into a shape that is perceived as more beautiful in society or in the individual's mind. This desire for transformation may arise from the desire to return to a perceived youthful appearance or dissatisfaction with one's current appearance<sup>3,4</sup>.

Reconstruction positively influences an individual's self-confidence, body image perception, interpersonal relationships, and social interaction<sup>5</sup>. Such interventions have positive effects on mental health, emotional state, body satisfaction, and social life. To achieve successful outcomes from plastic surgery procedures, a thorough psychiatric evaluation should be conducted during the preoperative period to assess individuals' mental readiness<sup>6,7</sup>.

While each surgical procedure presents its own unique challenges, interventions that alter physiological functions and disrupt body integrity, ultimately affecting one's lifestyle, can threaten body image and self-esteem<sup>1</sup>.

In patients undergoing plastic and reconstructive breast surgery, the size, shape, and symmetry of the breasts can have psychological, sexual, and physical implications for the patients<sup>3</sup>. The breasts not only encompass secondary sexual characteristics but also hold importance in terms of the historical development of human beings and the continuity of generations<sup>8</sup>. Breastfeeding is crucial for the healthy development of future generations. In patients with excessively large breasts, physical quality of life can be significantly

affected, especially in conjunction with clothing choices. Disturbances in breast symmetry or excessively small or large breast size can lead to body image distortions and sexual inadequacy<sup>10</sup>. Individuals with excessively large breasts may experience physical activity limitations due to their breast size. Inability to adhere to desired clothing styles can lead to social isolation and subsequent psychological traumas<sup>11</sup>.

### ***Breast reduction surgery***

Breast size, shape, and symmetry can affect patients psychologically, sexually, and physically. The breast is not only a secondary sexual characteristic but also important for the continuation of the human race in terms of historical development. Breastfeeding is important for the growth of healthy generations<sup>12</sup>. In patients with excessively large breasts, especially along with their clothing style, their physical lives can be affected. Disturbance in breast symmetry and extreme size, whether small or large, can result in distorted self-perception and sexual inadequacy<sup>13</sup>. Physical activity may be restricted in individuals with excessively large breast size. Inability to implement the desired clothing style can lead to social isolation and various psychological traumas thereafter. In summary, a woman's breast size can affect her lifestyle, career, and social relationships<sup>14</sup>.

In patients with excessively large breasts, serious postural disorders occur due to the physical burden. Scoliosis, vertebral problems, chronic pain, and later on, neck pain can develop in these patients. Some patients may experience neurological symptoms such as numbness in the fingers in the long term. Reduction patients attract attention with high satisfaction rates due to the mentioned reasons<sup>15</sup>. However, especially due to the decreased sensitivity of the nipple after the operation, sexual life can be affected. Breastfeeding can be negatively affected by the impairment of nipple-areolar complex sensation<sup>14</sup>.

### ***Pathological physiology of hypertrophic breast***

Massive breast enlargement or gigantomastia was first described by Durston in 1670. The main factor in the development of giant breasts is believed to be an excessive end organ response to estrogen. However, Jabs and colleagues have shown that increased sensitivity to this receptor response exists in some patients, while in other patient groups, despite physiological estrogen



levels and receptors, breast hypertrophy can occur. The pubertal period and pregnancy, during which physiological values change, are the stages in which estrogen and receptor levels increase, and giant breasts are most commonly observed. The majority of the mass volume of giant breasts consists of adipose tissue and fibrous tissue, with a smaller portion containing glandular tissue<sup>16</sup>.

According to Kupfer and Dingman, pubertal massive breast hypertrophy is generally associated with fibroadenoma, phyllodes sarcoma, virgin hypertrophy, breast hamartoma, and trauma<sup>17</sup>.

Gigantomastia is characterized by excessive growth of breast tissue and has been defined by the removal of tissue weighing up to 1800 grams. The breasts are more affected by gigantomastia compared to simple breast hypertrophy occurring in the early years of puberty. Surgery takes the first priority in the general treatment approach to gigantomastia. According to Netscher and colleagues, reduction mammoplasty is necessary, especially in young patients and in the presence of massive asymmetric breast hypertrophy, and it improves patient comfort<sup>18</sup>.

Despite the option of surgery, recurrent massive hypertrophies can pose a problem in subsequent pregnancies. In these cases, repeat surgery is the first treatment option. Furthermore, no changes in hormone levels have been observed in this patient group<sup>19</sup>.

One study that explains the mechanisms of breast hypertrophy is Eliassen's study on atypical ductal hyperplasia. This study has shown that ductal hyperplasia may play a role in the etiology of breast hypertrophy. In the examinations, no malignant progression was observed in five out of five women, and all patients were followed up for nearly 39 months after the operation<sup>20</sup>.

Recent experimental studies have shown that reducing hormone levels does not control gynecomastia. Baker and colleagues have reported successful experiments with combined tamoxifen and reduction mammoplasty in pubertal gigantomastia cases. Baker and colleagues presented four cases in the literature. In this study, patients prone to gigantomastia recurrence were treated. Unlike the other three patients, the patient who had passed the pubertal period did not experience recurrence and was treated with only one surgical intervention<sup>21</sup>.

### ***Surgical indications for breast reduction***

In general, it is important for breast size to be proportionate to body measurements in terms of musculoskeletal health. Otherwise, the symptoms can vary widely. In advanced cases, severe pain, eczema, fungal infections, petechial lesions, and pressure ulcers due to shoulder strap pressure can be observed. Neurological findings can occur in the upper extremities, such as complaints of paresthesia on the ulnar side of the upper extremity. Vertebral disorders such as kyphosis and scoliosis, as well as degenerative findings, are observed in advanced cases<sup>22</sup>.

The importance of the physical and psychological changes that occur in patients undergoing breast reduction is known by many surgeons. Although it may be difficult to standardize these changes in psychological terms, their significance should not be disregarded in the plastic surgery community<sup>15</sup>.

The relationship between the relief of these pains and reduction surgery has been investigated by Netscher and colleagues in patients with excessively large breast sizes. In this study, the authors suggested that it is more appropriate to evaluate variations in symptoms rather than the amount of tissue in the definition of symptomatic gigantomastia. There is no relationship between the patients' body mass indexes and symptoms; it has been found that different symptoms can occur in overweight patients independent of breast size. Therefore, according to the researchers, macromastia can be symptomatic regardless of the patient's age and weight<sup>18</sup>.

The impact of breast hypertrophy on quality of life has been examined by Kerrigan. In the first study conducted in this patient group, an average utility value close to patients with kidney transplantation or cardiac complaints (moderate angina pectoris) was determined. In another study, two groups of patients, one with a surgical treatment request and one without, were compared with a control group consisting of patients without breast hypertrophy. It was observed that there was a significant deterioration in patients' quality of life due to breast hypertrophy, as assessed by validated methodological questions (EuroQol, McGill pain, etc.). However, it was thought that this result was more related to the symptoms experienced by the patients rather than the breast size itself<sup>3</sup>.

The second study examined the effects of surgery on patient comfort. This study was conducted with a study group that would undergo surgery and two control groups. The control groups consisted

of patients with breast hypertrophy and bra size D or larger in the first group, and patients with normal breast size and bra size smaller than D in the second group. The effects of non-surgical procedures on symptomatic relief were analyzed in all subgroups. The quality of life parameters mentioned earlier was used. A total of 179 cases were followed preoperatively and postoperatively; a study group consisting of 88 women with hypertrophic breasts and a control group consisting of 96 patients were selected. Before surgery, it was found that 50% of the patients had constant or periodic back, neck, and shoulder pain related to the breasts. After the surgery, this rate decreased to less than 10%. Non-surgical treatment options were compared as subgroups in both patient groups. These conservative treatment options, including significant weight loss, did not result in any symptomatic improvement in the patients. Postoperatively, improvement was seen in the patients' quality of life standards compared to national values ( $P < 0.05$ ). All these studies have shown the importance of appropriate surgical treatment in improving quality of life<sup>3,23</sup>.

The objectives of reduction mammoplasty include Preservation of maximum sensitivity and circulation of the nipple: One of the goals of breast reduction surgery is to preserve the sensitivity and blood supply of the nipple as much as possible. Relief of pain, eczema, and symptoms related to posture: Breast reduction aims to alleviate symptoms such as pain, eczema, and postural issues that are associated with large breasts. Proper positioning of symmetrically located nipples: The surgery aims to position the nipples in the correct location with proper symmetry. Minimal scar formation: Reducing the visibility of scars is an objective of breast reduction surgery. Surgeons strive to minimize scarring and achieve the best possible aesthetic outcome. Achieving a shape that conforms to aesthetic standards: The surgery aims to achieve a breast shape that is aesthetically pleasing and proportional to the patient's body. Minimizing wound-related issues using atraumatic surgical techniques: The use of minimally traumatic surgical techniques helps minimize complications and issues related to the surgical incisions<sup>24</sup>. Ensuring strong parenchymal support for long-lasting results: Breast reduction aims to provide adequate support to the breast tissue, resulting in long-lasting and stable outcomes. In addition to these objectives, many similar goals can be listed from the perspective of patient satisfaction. However, ongoing studies focus particularly on preserving nipple sensation and vascular structure, which may become a primary objective in the coming years, especially

in younger patient groups, considering sexual function<sup>25</sup>.

### ***Breast nipple size and position***

The ideal diameter of the areola can vary from person to person but is typically between 38 to 45 mm on average. However, in cases of hypertrophic breasts, the areola diameter may be found to be increased due to tension on the skin. In such cases, communication between the patient and the surgeon is important for determining the final size of the areola<sup>26</sup>.

Various methods have been reported for determining the ideal position of the nipple. In a clinical study conducted by Penn et al., an investigation was carried out to determine the ideal position in a total of 150 healthy subjects, with 20 of them being considered aesthetically ideal. In a woman with limbs measuring approximately 21 cm, an equilateral triangle is formed with the suprasternal notch representing the apex and the nipples representing the other two corners. The distance of 21 cm also corresponds to the distance from the nipple to the midclavicular line. The distance between the nipple and the inferior aspect of the breast was measured to be an average of 6.9 cm<sup>27</sup>.

Another useful method for determining the final position of the nipple is the identification of the Pitanguy point. This point is determined by the intersection of the lower breast point with the midclavicular line. Some surgeons believe that the ideal level of the nipple after surgery should be at this point<sup>28</sup>.

Several studies have attempted to determine the critical values and appropriate volumes for an ideal breast. However, despite these studies, the statistical results of the investigations conducted to determine the ideal position of the breast have not found widespread clinical application. Many surgeons agree that applying standardized anatomical data derived from the standardization of these values is not feasible for patients with different skeletal structures and breast shapes<sup>29</sup>.

### ***Breast reconstruction***

#### ***Breast reconstruction methods***

Breast reconstruction is one of the most commonly performed procedures by plastic surgeons. Over time, breast reconstruction has become more complex and sophisticated for various reasons. Firstly, the development of

repair options with perforator flaps, simultaneous implants, and allografts has expanded our choices for reconstruction. Secondly, there is an increasing number of women diagnosed with breast cancer at a younger age<sup>30</sup>. Prophylactic bilateral mastectomy for patients with BRCA gene mutations has led to the need for bilateral breast reconstruction in younger women. The routine application of skin-sparing mastectomies and even nipple-sparing surgeries has made it possible to perform breast reconstructions that are more natural and realistic with minimal scarring. Reconstruction with implants has become more common in patients who will undergo radiation therapy. The goal of breast reconstruction is to create breasts that are more natural, aesthetically pleasing, and symmetrical with the remaining breast tissue. The challenge lies in being able to provide the right treatment to the right patient at the right time and integrating this treatment into the oncological treatment plan<sup>31</sup>.

#### *Breast reconstruction planning:*

- Appropriate timing
- Treatment for the contralateral breast
- Selecting the most suitable reconstruction method with low complication rates and good outcomes. In the preoperative period, the patient should be provided with detailed information about treatment plans and options, and the final decision should be made in collaboration with the patient<sup>32</sup>.

#### **Implant-based reconstruction**

Although autologous tissue repair is considered the ideal method for breast reconstruction, the extent of the surgical procedure, the length of the recovery period, potential complications, and the resulting scar raise concerns for many patients. Additionally, if simultaneous reconstruction is planned to be followed by radiation therapy, placing an expander initially can protect the flap from the adverse effects of radiation. Autologous reconstruction can be performed by de-epithelializing the pocket created by the expander after radiation therapy. Implant-based reconstruction is the simplest reconstruction method that can be applied in a patient undergoing mastectomy. However, achieving satisfactory, aesthetically pleasing results that appear natural and create a similar outcome to the contralateral breast in unilateral cases is not easy, despite the procedure being short and straightforward<sup>33</sup>.

#### **Simultaneous reconstruction with permanent/adjustable implant**

The awareness of breast cancer risk factors and the accessibility of genetic testing have increased the rates of bilateral mastectomy in young women. These patients are willing to undergo simultaneous reconstruction with minimal scarring and minimal loss of workforce. Additionally, many of these patients are already dissatisfied with their breasts and consider or plan to use implants. For these patients, a single-stage simultaneous breast reconstruction can be planned, which will result in minimal scarring and also correct any pre-existing small breast or ptosis conditions<sup>34</sup>.

*The single-stage repair technique consists of the following stages:*

- Skin-sparing mastectomy
- Muscle release and inframammary fold reconstruction
- Use of permanent or adjustable implants

Preoperative planning should be done jointly by the plastic surgeon and the oncologic surgeon. The inframammary fold is marked, the width of the skin resection is determined, and the feasibility of skin-sparing or nipple-sparing techniques is decided. The skin-sparing mastectomy is performed by the general surgeon, taking care to preserve the vascularity of the skin flaps. During the operation, it is important to pay attention to preserving the nipple-areolar complex or areolar skin, avoiding injury to the fascia and muscle, preserving the inframammary fold, and maintaining the circulation of the skin flaps to achieve optimal reconstruction<sup>35</sup>.

After mastectomy, the integrity of the inframammary fold and muscle is evaluated. If the muscle and fold integrity are fully preserved, a method similar to the subpectoral breast augmentation technique can be applied. The pectoralis major muscle, starting from its lateral border, is dissected into subpectoral and serratus anterior muscle pockets until approximately 2 cm below the level of the inframammary fold. The muscle fibers and rectus fascia are incised at this level, preserving the inframammary fold. In operations performed with preservation of muscle integrity and attachment site, there is no need for fixation sutures or dermal grafts. If the decision is made to separate the pectoralis muscle, there are two options:

- Removing the pectoralis and serratus muscles: Both muscles are sutured together. Fixation is performed to prevent muscle traction. For this fixation, sutures, mesh, acellular dermis, or autologous dermis can be used.
- Removing only the pectoralis muscle: Fixation is performed using acellular dermis from the inferior and lateral sides.

Dissection begins from the lateral aspect of the pectoralis major muscle. The muscle is lifted, freeing the inferior attachment site and partially from the medial side. The serratus muscle is then lifted from the lateral side, and the pectoralis major muscle is separated from its inferior level. These two muscles are then sutured intermittently to expand the submuscular pocket. If there is any muscle injury or loss, acellular dermal grafts are an excellent choice for strengthening the muscle<sup>36</sup>.

During the surgery, an adjustable sizer is placed under the muscle, and it is partially inflated to evaluate the size and position. The inferior edge of the muscle or the dermal graft is sutured to the fascia at the level of the inframammary fold. By leaving a gap of approximately 0.5-1 cm between the inferior end of the dermal graft and the inframammary fold, the lower pole can expand differently, creating a more anatomical pocket. Afterward, the sizer is replaced with a selected permanent or adjustable implant. The adjustable implant is inflated to the desired amount, without compromising the vascularity of the skin flaps. The injection port is placed laterally or in the axillary region. The skin incisions are closed using a purse-string or V-Y closure technique<sup>37</sup>.

### ***Tissue expander-assisted two-stage (delayed immediate) reconstruction***

Tissue expansion followed by reconstruction with saline or silicone gel implants, is the most commonly performed method of breast reconstruction in the United States. In the early days, the results associated with this method were variable, with high complication rates reported. However, advancements in expander and implant technology, revised patient selection criteria, and modifications in surgical techniques have improved aesthetic outcomes and reduced complications. As a result, tissue expansion has gained popularity and has become the preferred method for simultaneous breast reconstruction. The reasons for choosing the two-stage expander-implant approach for breast reconstruction include

its relative ease, lack of donor site requirement, and faster return to normal activities<sup>38</sup>.

**Patient Selection:** The success of simultaneous expander and implant reconstruction begins with careful patient selection. The patient's medical condition and evaluation of cancer treatment should be taken into consideration. These patients are generally assumed to receive adjuvant chemotherapy starting 4-6 weeks after mastectomy<sup>39</sup>. Additional cancer treatments such as radiation therapy, if applicable to the patient, should be evaluated in conjunction with the oncologic surgeon, medical oncologist, and radiation oncologist. If the patient is expected to undergo radiation therapy, the decision of whether to perform two-stage simultaneous expander-implant reconstruction should be made. This method can be safely applied in selected patients by completing expansion before radiation therapy or, based on a multidisciplinary decision, reconstruction can be postponed until after all treatments are completed<sup>40</sup>. Therefore, delayed simultaneous reconstruction is primarily preferred in patients with a high probability of receiving radiation therapy after mastectomy (in addition to all Stage II and above patients, those with T2 tumors, axillary involvement, widespread microcalcifications, and multisentric involvement). The ideal patient type is someone who is close to or slightly overweight (with a BMI not exceeding 28), has not received previous radiation therapy, and has mobile tissue over the ribs<sup>41</sup>. The pectoralis muscle should be intact, and the skin flaps should not be too thin. In patients undergoing unilateral mastectomy, the contralateral breast should also be evaluated to determine whether symmetry can be achieved. The size, base width, and amount of ptosis in the contralateral breast should be assessed, and the appropriate procedure should be planned accordingly<sup>42</sup>. In patients with a thin build, small or medium-sized breasts, who desire bilateral breast reconstruction, the lack of sufficient tissue for autologous reconstruction poses a barrier to such transfer. If the patient does not desire a small breast, she is not suitable for autologous transfer. As the patient's desired breast size increases, reconstruction can be achieved by expanding the tissue and creating a suitable pocket for an implant using the two-stage expander-implant method. On the other hand, expander-assisted two-stage reconstruction is a more reliable method than single-stage implant reconstruction in terms of mastectomy flap necrosis risk group, which includes smokers, obese individuals, and diabetic patients<sup>43</sup>.

**Contraindications:** The definite contraindications of the method include infection, necrosis or poor quality of the chest wall skin, and having undergone radical mastectomy. Relative contraindications include previous radiation therapy to the chest wall and obesity<sup>44</sup>.

**Planning:** After selecting the simultaneous two-stage expander-implant method, a personalized surgical plan is made for the patient. The oncologic surgeon and the patient jointly decide on the incision pattern. The most important part of preoperative planning is measuring the length of the breast base. For example, in a patient who desires a larger breast size but has small breasts, the expander can be planned slightly wider than the original base to fit the patient's chest measurements. In unilateral repairs, the expander size is planned according to the width of the contralateral breast. There are various types of expanders that can be used for breast reconstruction. These include expanders that can be inflated in different amounts in the upper and lower chambers and can serve as a permanent implant after the port is removed (Becker type), as well as single-chamber expanders that come in various sizes and shapes. In our clinic, integrated port anatomical tissue expanders are used. These tissue expanders have a more practical use compared to remote port expanders, but their only disadvantage is that they contain a metal component, which makes them unsuitable for MR imaging during the treatment period<sup>45</sup>.

**Placement of Tissue Expander:** The reconstructive procedure begins with the inspection of the surgical site after mastectomy, ensuring hemostasis, and checking the viability of the skin flaps. Tissue support can be provided either with the pectoralis major muscle alone or with the combination of the pectoralis major, pectoralis minor, and serratus anterior muscles<sup>43</sup>. The lateral edge of the pectoralis major muscle is lifted, starting from its origin, and by releasing its medial and inferior attachments, it is ensured to remain in the submuscular plane. The serratus muscle and fascia are also lifted laterally to create a suitable pocket for the expander<sup>44</sup>. After thoroughly irrigating the pocket with antibiotic saline solution, separate drains are placed in the submuscular and subcutaneous planes, and the expander is placed beneath the muscle. Support is provided by suturing the lateral edge of the pectoralis muscle and the serratus muscle. During the surgery, the expander is inflated to half or two-thirds of the desired volume based on the circulation of the skin flaps<sup>42</sup>. The incisions are closed, and the drains are left in place for an average of three weeks.

The expander is gradually inflated starting from the third week, and it is inflated for an average of three sessions to reach the desired size before radiotherapy. Radiotherapy is planned and administered with the expander fully inflated<sup>45</sup>.

**Second Stage:** The planning of the second stage begins with the evaluation of the expander and the surrounding tissue. Special attention should be given to the shape and position of the inframammary fold. Capsulotomy can be performed to lower or extend the inframammary fold laterally and medially. Capsulorrhaphy can be performed to raise the inframammary fold or narrow the lateral fold. The incisions are made a few centimeters above the inframammary fold to avoid changing its shape and position. The selection of the implant is based on preoperative measurements and the desired breast projection and shape<sup>45</sup>.

### ***Potential complications in breast reconstruction with implants***

**Ischemia and necrosis at the incision site:** Ischemia and necrosis at the incision site can occur within 1-7 days after surgery. Surgical excision and closure are performed as soon as the process is complete for treatment. The occurrence of wound edge necrosis is more common in simultaneous repairs but can be seen in 1-3% of patients<sup>46</sup>.

**Hematoma:** Hematoma, which can occur immediately or shortly after surgery, should be urgently explored surgically and irrigated and drained under antibiotic support. Hematoma, seen in less than 1% of patients, can lead to capsular contraction and infection if left untreated<sup>46</sup>.

**Implant Infection:** Implant infection is the greatest threat to breast reconstruction. The incidence ranges from 0.5% to 2%. The first symptoms and signs can be observed between 5 days and 5 weeks after surgery. Infections caused by *Staphylococcus aureus*, *Staphylococcus epidermidis*, or *Pseudomonas* are usually characterized by the formation of abscesses around the 5th to 7th day. Common systemic symptoms include widespread redness, swelling, tenderness, fever, and fatigue. It should be considered as an urgent condition, and patients should be hospitalized for close monitoring and intravenous antibiotic therapy. Material should be obtained for culture. If there is no improvement and the condition worsens, immediate exploration is indicated. During exploration, if purulent and granulation tissues are encountered, the best

approach may involve removal of the implant, debridement of the infected tissues, intermittent irrigation of the pocket, and placement of a drain to close the wound. In cases where there are fewer signs of infection during surgery, the implant can be replaced with a smoother-surfaced implant, and the patient should be closely monitored. Appropriate antibiotic treatment should continue for 4-6 weeks. Patients with infection around the implant should be closely monitored for sequelae using ultrasound. Bedside aspiration can be performed if there is fluid presence around the implant. If the implant cannot be salvaged through these procedures, it should be removed, and reconstructive procedures should be delayed for 6-12 months<sup>47</sup>.

**Capsular Contraction:** The rate of symptomatic capsular contraction varies between 3% and 5%. Keeping the inflation chamber of adjustable implants in place permanently is a valuable tool to treat this complication. Overinflation of the implant and achieving more expansion than desired 2-3 months after the onset of symptoms often solves the problem. If this solution cannot be achieved, complete or near-complete capsulectomy and implant replacement are performed. In cases where there is insufficient or thin soft tissue, autologous reconstruction can be added with the latissimus dorsi muscle flap<sup>48</sup>.

**Other Complications:** Other complications include port rotation, disruption of implant integrity, surface irregularities, and rippling<sup>49</sup>.

### ***Autologous tissue breast reconstruction***

According to some authors, breast reconstruction using autologous tissue has several advantages over implant-based reconstruction, such as lower overall cost, better cosmetic results, and the absence of foreign materials. Autologous reconstruction becomes the sole option when the problems associated with implants arise or are anticipated. The advancement of microsurgical techniques and the use of perforator flaps have improved autologous tissue reconstruction. The surgical team now has a variety of flap options with improved reliability. The development and increased use of breast-conserving surgical techniques, along with advancements in radiotherapy, have contributed to achieving optimal results<sup>50</sup>.

Autologous tissue sources for breast reconstruction include:

Dorsal and lateral thoracic regions:

- Latissimus dorsi flap
- Thoracodorsal artery perforator flap
- Intercostal artery perforator flap

Lower abdomen:

- Transverse rectus abdominis flap (TRAM) with pedicled, free, and muscle-sparing options
- Deep inferior epigastric artery perforator flap (DIEP)
- Superficial epigastric artery flap

Hip and peri-iliac region:

- Rubens flap
- Superior gluteal artery perforator flaps (SGAP)
- Inferior gluteal artery perforator flaps (IGAP)

Thigh:

- Gracilis flap
- Anterolateral thigh flap (ALT)
- Medial thigh perforator flaps

Autologous tissues can also be used in conjunction with implants to prevent and treat complications associated with implants<sup>51</sup>.

Breast cancer is a disease that negatively impacts women biologically, psychologically, socially, and economically due to its uncontrolled growth and abnormal spread. It is considered a significant public health issue due to its high prevalence and poor prognosis<sup>25</sup>. Breast cancer is the most common type of cancer and the leading cause of cancer-related death in women 15,25. According to the American Cancer Society's 2005 statistics, one in every eight women who reach the age of eighty is at risk of developing breast cancer. In Turkey, it is estimated that 10,000 women are diagnosed with breast cancer each year<sup>25</sup>. Breast cancer accounts for 24.1% of all cancers in Turkey<sup>14</sup>. Although radical mastectomy is no longer the preferred treatment option in breast cancer due to changing technology and surgical techniques, breast reconstruction remains an important procedure when this method is

employed. While the primary goal of breast cancer treatment is the removal of cancer cells from the breast, post-treatment body image is a significant concern for women. The new appearance of the breast is one of the most important aspects in this regard<sup>25</sup>. Nurses need to be equipped not only with the physical care of patients undergoing mastectomy but also with education for the patient and their families, planning and implementing patient-centered care, and addressing social and psychological care needs<sup>10</sup>.

### ***Complications observed in autologous breast reconstruction***

In the surgical treatment of breast cancer, modified radical mastectomy (MRM) is commonly used. Complications are observed in two out of three patients undergoing MRM. Additionally, the timing and staging of the breast reconstruction surgery also affect the types of complications that may arise<sup>10</sup>. Some of the complications include necrosis of the transferred tissue, blood clot formation, pain, and weakness in the donor area where the tissue is harvested. Following mastectomy, some patients may experience loss of sensation and numbness in the breast, often due to nerve damage. Complications related to mastectomy occurring within the first month after surgery are referred to as early-stage complications, while those occurring after the first month are considered late-stage complications<sup>52</sup>. Early-stage complications include seroma formation (25%), wound infection (10%), deep vein thrombosis (6%), pulmonary embolism (2%), and myocardial infarction (1%). Late-stage complications include lymphedema (11%), muscle atrophy (7%), restricted arm movement (8%), neuralgia (5%), skin stiffness (5%), hypertrophic scar formation (2%), and sinus formation (2%). Chronic pain is another long-term complication, with an incidence rate ranging from 4% to 22%. It is believed that chronic pain is caused by nerve damage during the surgical procedure, and this damage also contributes to limited arm movement. Chronic pain syndrome is more commonly observed in patients who undergo modified radical mastectomy compared to those who undergo breast-conserving surgery. In a study, it was reported that 70% of patients experienced numbness, 33% experienced pain, 25% experienced motor weakness, 24% experienced limb swelling, and 15% experienced stiffness. The same study found that 39% of patients had a significant impact on their daily activities<sup>10</sup>.

Generally, complications observed in patients undergoing breast reconstruction include bleeding, hematoma, seroma, hernia, partial or complete necrosis of TRAM flap, fat necrosis, abdominal wall weakness, and infection. The likelihood of complications is higher in obese individuals, those with hypertension, diabetes mellitus, and smokers<sup>15</sup>.

Autologous breast reconstruction involves a longer surgical procedure and longer recovery time. Reconstructions performed with pedicled flaps are usually completed in a shorter period compared to free flaps, resulting in shorter hospital stays. Surgical procedures with free flaps, on the other hand, have longer durations<sup>10</sup>.

### ***Nursing care in the preoperative and postoperative periods of breast reconstruction***

The care of patients undergoing breast reconstruction is a collaborative process involving team members such as physicians, nurses, physical therapists, and psychologists, aiming to achieve success. Nursing care is of significant importance both before and after breast reconstruction. Nursing care in breast reconstruction should be planned to encompass the following fundamental aspects<sup>53</sup>.

#### ***Preoperative patient preparation:***

The preoperative period is a time when both the patient and their family experience fear and anxiety. The patient should be encouraged to discuss the procedure and share their feelings.

The patient should be allowed to ask questions, and the questions should be answered with simple, understandable, and free of medical terminology.

It is expected that some issues related to recovery may arise in any type of breast reconstruction. In such cases, the removal of the flap and reconstruction with an alternative method may be necessary. This situation should be explained to the patient in an appropriate manner.

The patient should be educated about the postoperative care, and if possible, written educational materials should be provided to support this education.

All necessary legal preparations should be completed prior to the surgery.

The patient should be taught respiratory exercises and the use of a spirometer, and it should be explained that these should be performed every hour after the surgery. This education helps eliminate potential respiratory problems in the postoperative period and also contributes to expediting the recovery process.

The patient should be supported in quitting smoking (4 weeks prior to the surgery), discontinuing medications such as aspirin one week before, and achieving a body mass index (BMI) of 27 or below through weight loss.

The patient should be reminded to obtain a sports bra and an abdominal binder (to be worn on the day of discharge) for the postoperative period.

The patient should be informed that there will be a dressing on their abdomen or back during the postoperative period<sup>54,55</sup>.

#### *Postoperative patient care:*

Breast reconstruction surgery typically lasts for an average of 4-8 hours. When the patient is brought to the clinic, they should be monitored using a cardiac monitor and oxygen saturation monitor. Intravenous fluids, drainage tubes, and a urinary catheter should be carefully monitored, and intake and output should be recorded.

The patient's blood pressure, pulse, body temperature, respiration, and pain should be evaluated every hour. The patient should be kept warm, as this promotes blood flow to the flap. Ventilator use should be avoided, and the room should not be exposed to drafts. Measures should be taken to ensure that the patient's body temperature does not drop below 37°C.

The patient's pain should be effectively managed. Nausea and vomiting symptoms should be monitored.

Patients undergoing breast reconstruction should be closely monitored for complications. It is important to inform the patient about the possibility of complications developing months or even years after the surgery.

Following the surgical procedure, signs such as swelling, pain, a sense of heaviness, and fluid accumulation under the breast incision or axillary region should be carefully monitored as indications of seroma.

Increased bloody drainage from the drain within

the first 12 hours indicates hematoma. Swelling, tension, pain, and bruising in the surgical area should be evaluated, and the amount and color of drainage should be monitored.

The patient should be instructed to wear compression stockings during the postoperative period. The patient should be encouraged to move their feet (forward and backward) while in bed.

If no issues related to the flap arise within the first 24 hours, the patient can begin drinking clear fluids (water, apple juice, etc.).

The reconstructed breast should be examined every 15-30 minutes during the first 24 hours. This examination includes assessing the softness, warmth, and color of the flap through touch and checking the pulse using a Doppler device. In the following days, the flap should be checked every hour.

During dressing changes, the area where the flap is located should be evaluated for signs of infection (redness, discharge, pain, odor) and inadequate tissue perfusion (bluish discoloration and insufficient capillary refill).

The flap and donor area should be protected from trauma. Tight-fitting clothes and bras with underwires that may impede blood flow should be avoided.

The patient should avoid sudden movements and gradually transition to daily life activities. They should avoid heavy lifting and lying in a prone (face-down) position. During sexual activities, care should be taken to avoid harming the donor area and flap.

The patient should be informed about when they can start driving (usually after one week) according to the physician's permission, and they should be reminded to attend a follow-up appointment six weeks after the surgery.

The patient should be taught how to perform self-breast examinations, emphasizing the importance of conducting regular self-examinations on a specific day each month. They should also be advised to undergo recommended mammography screenings at the recommended intervals.

Patients who undergo autologous breast reconstruction may benefit from physical therapy. Physical therapy helps restore shoulder mobility and assists in addressing weakness in the donor



area. A physical therapist can help the patient regain strength, determine the safest way to adapt to new physical limitations, and adjust to daily life activities. It should be explained that breast reconstruction does not increase the risk of breast cancer recurrence or interfere with screenings such as mammography<sup>23, 56</sup>.

#### *Discharge education:*

The patient should be informed about the pain medications they can take at home when experiencing pain.

It should be emphasized that the patient needs to attend a follow-up appointment within 10 days after the surgery.

The patient can be informed that they can take a shower three days after the surgery, but if the drains have not been removed, they should wait until the drains are removed.

The patient should be advised that they can perform light household chores during the first 4-6 weeks.

The patient should be instructed to use an abdominal corset and supportive bra for 6 weeks after the surgery. However, heavy aerobic exercises should be avoided during the first 6 weeks. During this period, only walking and light stretching exercises may be appropriate.

The patient should follow the physician's recommendations regarding the timing of returning to work<sup>10,23</sup>.

## CONCLUSION

Physical health and beauty hold great importance for individuals throughout their lives. The size of a woman's breasts can impact her lifestyle, career, and social relationships. In addition to the diagnosis of breast cancer, the physical appearance after treatment is also a significant concern for women. Patients who undergo mastectomy seek ways to restore their breasts to their previous state. Autologous breast reconstruction, which is widely used today, is presented as a good option for women to achieve a more natural appearance after reconstruction. Breast reconstruction, when performed with appropriate surgical intervention and effective nursing care, can contribute significantly to increasing patient satisfaction and helping them return to their normal lives as quickly as possible.

## Conflict of interest statement

The authors declare that they have no conflicts of interests.

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## HEALTH WORKERS' THOUGHTS ABOUT BRAIN DEATH AND ORGAN DONATION

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### ABSTRACT

#### Keywords

Brain Death,  
Organ Donation,  
Donor

*Organ and tissue grafting (transplantation) is the transfer of a healthy, functioning organ or tissue or a portion of one, from either a living or a brain-dead patient, to replace a corresponding but no longer functioning organ or tissue in the body of another patient. The goal of this study was to ascertain the attitudes and knowledge of the doctors and other personnel in our hospital concerning organ donation, to raise awareness of transplantation in health workers, whom we deem to be the driving force in organ donation, and to identify our shortcomings in this regard. The questionnaire in our study was administered to 315 health care personnel who work at Sivas Paradigm (Numune) Hospital. We conducted the 32-question survey on participating staff members with the aim of determining their positions on brain death, whether they were organ donors, their views on organ donation, and any ideas they might have about changes that could be made in our country to increase organ donation. The results obtained were analyzed and evaluated using the descriptive statistical methods of the SPSS 14.0 software package. Of the employees surveyed, 42 (13.3%) indicated they had no knowledge about brain death, 119 (37.7%) declared they had received no in-service training concerning brain death, and 201 (63.8%) said they were not organ donors. In response to the question of what should be done to improve organ donation, 248 (78.7%) recommended explaining its acceptability from a religious standpoint, 171 (54.2%) advised more frequently sharing with the public both the drama of those awaiting transplant surgery and the great joy of those who now have a new lease on life thanks to organ transplants, 139 (44.1%) said it was necessary to explain the issue to the public at intervals on radio and television, 100 (31.7%) endorsed expressing the importance of this issue to health care professionals during the course of their education, and 32 (10%) indicated cash awards should be offered to the loved ones of potential donors. We believe health care workers are the most important group to lead the community in organ donation. It is our considered opinion that our number one priority is to develop training programs with the aim of enhancing the interest and knowledge of those professionals about this subject, and also to utilize the mass media to change society's perspectives concerning the issue.*

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### INTRODUCTION

Organ and tissue grafting (transplantation) is the transfer of a healthy, functioning organ or tissue or a portion of one, from either a living or a brain-dead patient, to replace a corresponding but no longer functioning organ or tissue in the body of another patient. Organ transplantation is seen as the last chance for patients suffering organ failure<sup>1</sup>. Organ/tissue donation is the name given to the certified permission granted by a living person of her own free will for the use of her tissues and organs in the treatment of other patients after she has been medically determined to have reached the end of her life<sup>2</sup>. The purpose of organ transplantation is to save the lives of and improve the length and quality of the lives of patients, the failure of whose organs has brought about the end of their lives or decreased the quality of their lives<sup>3</sup>.



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There are two types of organ transplantation: from live donors and from cadavers. In live donor transplant, the organ is taken from a healthy, living person. Laws provide for a suitable organ to be harvested from among those of a volunteer who is usually a close relative. In cadaver transplant, the organs are removed from people who are clinically dead. "Clinical death" is generally taken to refer to cases of brain death. Organs donated from brain-dead cadavers are transferred to patients who need them and who have tissue compatibility<sup>4</sup>.

Organ and tissue transplantation is an important measure of a country's level of development. Many nations have developed legislation related to organ donation and transplantation. Such laws apropos to brain death and organ transplantation have been passed in Spain, Sweden, and Germany, as well as in other European countries in accordance with European Commission meeting rules<sup>5</sup>. In Turkey, organ transplants are performed in accordance with Law 2238, "On the Removal, Storage, and Transport of Organs and Tissues", dated May 29, 1979. Additionally, it has been reported that our country's High Council of Religious Affairs, in their Decision 396 of 1980, found organ transplantation to be permissible<sup>6</sup>. With the permission of next of kin, upon diagnosis of brain death by relevant specialists, organs can be harvested from the bodies of patients who have suffered irreversible brain injury (brain death) and died in the hospital<sup>7</sup>. Medical death must have taken place in order for the transplant to be performed. In accordance with Law 2238, the decision of medical death must be made unanimously by two physicians.

The human factor is very important in organ donation. When planning education to raise awareness of organ donation, the socio-cultural aspects of the people living in the community must be taken into account. Research has shown that as the education level rises, and as increased importance is given to public education that continuously keeps organ donation on the agenda, so does organ donation also increase<sup>8</sup>.

This study was performed in order to determine both the awareness, attitudes, knowledge, and perspectives of our hospital's staff and physicians concerning organ donation and what can be done with the experience of health workers to bring organ donation in our country up to the desired levels.

## **MATERIALS AND METHODS:**

In this study, a questionnaire was administered to 315 health personnel employed by Sivas Paradigm (Numune) Hospital. A 32-question survey was conducted of the participants for the purpose of determining their views on brain death and organ donation, their ideas about what changes could be made in Turkey to increase organ donation, and whether they themselves were organ donors. The results of the survey were analyzed with the SPSS 14.0 software package, using descriptive statistical methods.

## **RESULTS**

A total of 315 health care workers who work at Sivas Paradigm (Numune) Hospital participated in our study. Of the participants, 75 (23.8%) were physicians and 113 (35.85%) were male; 71 (22.5%) had worked in the health sector for less than five years, 92 (29.2%) for between five and ten years, and 150 (47.6%) for more than ten years (Table 1). Forty-two (13.3%) of the employees participating in the study said they had no knowledge about brain death, and 119 (37.7%) said they had never received in-service training concerning brain death; 201 (63.8%) said they were not organ donors. Of those non-donors, 43 (13.6%) said organ donation was contrary to their religious beliefs and 41 (13%) said they believed it was necessary for the body to remain intact after death (Table 2). In response to the question of what must be done to improve organ donation, 248 (78.7%) said it should be explained that organ donation was compatible with the potential donor's religion, 171 (54.2%) said it was necessary to more frequently share with the public both the drama of those awaiting organ donation and the great joy of those to whom organ donation has given a new lease on life, 139 (44.1%) recommended periodically explaining the issue to the public via radio and television, 100 (31.7%) said the importance of organ donation should be stressed to health care workers in the course of their education, and 32 (10%) advised offering the donors' next of kin cash awards (Table 3).

**Table 1: Employee specifics**

	n	%
<b>Profession</b>		
Doctor	75	23.8
Midwife, nurse, health officer	190	60.3
Health technician (emergency medical technician, laboratory, radiology, anesthesia)	50	15.9
<b>Sex</b>		
Female	202	64.15
Male	113	35.85
<b>How long have you been working in the health sector?</b>		
Less than 5 years	73	23.8
5-10 years	92	29.1
More than 10 years	150	47.1
<b>Where do you work?</b>		
Operating Room.	68	21.6
General Intensive Care Unit	35	11.1
Service Worker	212	67.3

**Table 2: Health workers' level of knowledge and thoughts about brain death**

	n	%
<b>Do you have any knowledge about brain death?</b>		
Yes	254	80.6
No	42	13.3
This subject does not interest me.	19	6.0
<b>If you have knowledge about brain death, in what year did you obtain this knowledge?</b>		
Before 2000	75	23.8
2000-2010	151	47.9
After 2010	65	20.6
No knowledge	24	7.6
<b>Where did you first hear the term "brain death"?</b>		
Newspaper or television	83	26.3
Education	188	59.7
From another health care worker	39	12.4
I've never heard the term "brain death"	5	1.6
<b>Have you ever received education concerning brain death?</b>		
Yes	177	56.2
No	119	37.8
I don't remember	19	6.0
<b>Have you ever had in-service training about brain death?</b>		
Yes	98	31.1
No	199	63.2
I don't know	11	3.5
I don't remember	7	2.2
<b>What is brain death?</b>		
I've only ever heard the term	41	13
Reversible impairment of brain function	60	19
Irreversible impairment of brain function	204	64.8
Impairment in which body organs affect brain functions	2	0.6
When brain functions cause deterioration of body organ functions	8	2.5
<b>Can a brain-dead patient breathe without the assistance of a ventilator?</b>		
Yes	75	23.8
No	226	71.7
I don't know	14	4.4

<b>Is medical treatment and/or mechanical support necessary to preserve the cardiac functions of a brain-dead patient?</b>		
Yes	244	77.5
No	59	18.7
I don't know	12	3.8
<b>Is brain death any different from a coma or a vegetative state?</b>		
Yes	198	62.9
No	94	29.8
I don't know	23	7.3
<b>Do you want to obtain information on brain death?</b>		
Yes	230	73
No	81	25.7
I don't know	4	1.3
<b>Is brain death diagnosed in our hospital?</b>		
Yes	237	75.2
No	42	13.3
I don't know	36	11.4
<b>Who diagnoses brain death?</b>		
Doctors	279	88.6
Nurses	35	11.1
I don't know	1	0.3
<b>Do you know how brain death is diagnosed?</b>		
Yes	167	53
No	91	28.9
I don't know	57	18.1
<b>Have you ever witnessed diagnosis of brain death?</b>		
Yes	104	33
No	211	66.9
<b>Do you believe a person diagnosed as brain dead can come back to life?</b>		
Yes	44	14
No	238	75.6
I don't know	33	10.5
<b>Do you think a person diagnosed as brain dead should continue to receive treatment if his/her organs have not been donated?</b>		
Yes	121	38.4
No	147	46.7
I don't know	47	14.9
<b>What is chronic organ failure?</b>		
Permanent disease of organs	60	19
Reversible organ failure	232	73.7
Irreversible organ failure	15	4.8
I don't know	8	2.5

**Table 3: Health workers' level of knowledge and thoughts about organ donation**

	n	%
<b>Are you an organ donor?</b>		
Yes	81	25.7
No	201	63.8
I'm considering it	29	9.2
I'm not considering it	3	1
I absolutely will not donate my organs	1	0.3
<b>If you are an organ donor, what is your most important reason for becoming one?</b>		
Because I believe that my donation can save a life	52	64.1
Because such a situation could happen to me or my family, I believe organ donation is necessary	20	24.7
Because people who've received organ donations have said it's necessary	7	8.6
Because of my previous education/training	1	1.3
Because of my religious belief that organ donation is necessary	1	1.3
<b>If you are not an organ donor, what is your most important reason for not becoming one?</b>		
Because I'm afraid of becoming an organ donor	40	19.9
Because I believe my organs will fall into the hands of organ thieves	12	3.8
Because I believe it will disrupt the integrity of my body	28	13.9
Because I don't know who my organs will be donated to	12	5.9
Because I don't have enough money	11	5.5
Because I'm not completely sure organ donation is compatible with my religion	98	48.9
<b>According to the laws of some countries, any citizen who is brain dead is considered an organ donor. What are your views on Turkey implementing this practice?</b>		
I support it	114	36.2
I don't support it	117	37.1
I have no opinion	84	26.7
<b>What effect do you think implementation of such a practice would have on the numbers of organ donations?</b>		
It would reduce them	46	14.6
I don't think it would have any effect	94	29.8
It would increase them	175	55.6
<b>If such a law were passed in Turkey, what do you think the public's reaction would be?</b>		
They would accept it	95	30.1
They would oppose it and apply to cancel their donor status	220	69.9
<b>Is one of your loved ones a patient awaiting organ donation?</b>		
Yes	60	19
No	227	72.1
I don't know	28	8.9
<b>If one of your close relatives needed an organ, would you become a donor?</b>		
Yes	175	55.6
No	75	23.8
I don't know	65	20.6



<b>Would you donate the organs of a loved one diagnosed as brain dead?</b>		
Yes	130	41.3
No	63	20
I don't know	122	38.7
<b>Should family permission be required before harvesting the organs of a person who became a willing donor while healthy?</b>		
Yes	166	52.7
No	127	40.3
I don't know	22	7
<b>What do you think should be done to raise the organ donor rate in Turkey?</b>		
The public should be educated about organ donation and told that it is acceptable from a religious perspective	248	78.7
Both the drama of patients awaiting organs and the great joy of patients who got a new lease on life thanks to transplants should be shared with the public	171	54.3
The importance of this issue should be explained at intervals on radio and television	139	44.1
This issue should be explained and its importance continuously stressed to health care workers in the course of their training	100	31.7
Health care workers dealing with this issue should be rewarded	40	12.7
Cash rewards should be offered to the donors' next of kin	32	10.2
I don't know	0	0

## DISCUSSION

In Turkey as in every other country in the world, one of the most important problems standing in the way of organ transplantation is the insufficiency of organ donation. In 2012, the total number of brain deaths in Turkey was 1,477, while the number of organ donors utilized was only 345. The number of patients currently awaiting kidney, heart, liver, pancreas, and lung transplants is over 60,000, and every year between 7,000 and 8,000 patients are added to that list. In 2012, thanks to insufficient organ donation, thousands of people lost their lives while waiting for human organs; meanwhile, the number of cadaveric transplants performed that year was a mere 881<sup>9</sup>. Studies show that while the proportion of Middle Eastern countries' populations who wish to participate in organ donation ranges from 29.7% to 75%, that of European countries varies between 51.8% and 90%<sup>10,12</sup>. In a trial with 408 participants in Pakistan, the organ donation rate was 3.5%; meanwhile, a study in Germany reported a corresponding rate of 20% among 1,002 participants, and the rate in our study was 25.7%<sup>13,14</sup>.

Of the participants in our study, 13.3% indicated they had no knowledge about brain death, 37.8% said they had received no information about brain death during their educational lives, 63.2% had not had in-service training, 35.2% did not know the meaning of brain death, 29.8% said brain death was the same as a permanent vegetative state, 25.5% did not want to learn about brain

death, and 14% claimed a person who had been diagnosed as brain dead could come back to life. These results make it clear that we have not yet been able to ensure that even health care workers understand the meaning of brain death. The vast majority of our study's participants do not approve of organ donations, and 63.8% of the whole have never even considered donating their own organs. While 48.9% of non-donor participants were not sure donation was acceptable according to their religious beliefs and yet 55.6% would accept an organ donation for a loved one who needed one, the fact that the proportion of those who would donate the organs of a next-of-kin who had died dropped to 41.3% is another indicator explaining the insufficiency of transplantation from cadavers in Turkey.

Several studies performed in Islamic countries show that religious beliefs are very important among people's reasons for rejecting organ donation<sup>12,15</sup>. In fact, such studies conducted in communities of Muslim countries have shown that the participants were not aware that organ donation was acceptable in Islam<sup>13</sup>. The Department of Religious Affairs of the Republic of Turkey, in the results of a review performed by the High Council of Religious Affairs, reported in Decision 396 dated March 3, 1980, that organ donation was permissible<sup>5</sup>. The Department must spearhead the education of the community about organ donation and transplantation.

The inclusion by clerics of this subject in their sermons in mosques, as well as the inclusion in the organ donation campaign of positive messages from religious leaders about organ transplantation, can contribute to the rise in the organ donation rate. In our study, in answer to the question, "What is the most important factor affecting your opinion of organ donation?" 13.7% of the participants answered that organ donation was contrary to their religious beliefs, 13.9% said it was necessary for their bodies to remain whole, and 13% replied that they themselves were not healthy enough to donate. Fear was cited by participants (19.9%) in their reasons for refusing to become organ donors. As was stated earlier, it was determined that a large proportion of participants in our survey (37.8%) had not received any information on this subject in the course of their education, and 63.2% of the total had received no in-service training. By educating society at large and raising their information level, we can make donors of those who in the past had harbored negative or ambivalent attitudes toward organ donation and transplantation. The easiest way to transmit information about organ donation and transplantation to the public is via the mass media. Television is the most effective vehicle for informing and mobilizing the public; including some scenes about organ donation and transplantation in broadcasts can lead to increased attention to this topic. We asked the question, "What do you think should be done in Turkey to increase the numbers of brain death diagnoses and of organ donors?". Of the respondents, 78.7% believed it was necessary to educate the public regarding this issue, and to explain that organ donation was acceptable from a religious viewpoint; 54.3% felt that the correct course of action was to share more frequently with the public both the drama of patients awaiting organ transplant and the great joy of those who had gained a new lease on life when they received transplants; 44.1% said they thought this subject should be explained to the public at intervals via radio and television; and 31.7% supported explaining and emphasizing the importance of this issue to health care specialists throughout the course of their education.

## CONCLUSION

Our conclusion is that educating the public about organ donation and transplantation, and having a positive attitude about them, are very important to increasing the number of organ donations. We believe health care workers are the most important group for leading the community in matters concerning organ donation. We feel that the first

priorities should be preparing a training program to increase the interest of health workers in this issue and to educate them about organ donation and transplantation, and utilizing the mass media toward changing society's perspectives about the subject.

## Conflict of interest statement

The authors declare that they have no conflicts of interests.

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## BACTERIAL RESPIRATORY DISEASE OF CATTLES

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### ABSTRACT

#### Keywords

Bovine respiratory disease,  
bacterial agents,  
cattles,  
calves

*Bovine Respiratory Disease Complex (BRDC) is one of the most important diseases in all over the world. It affects the lower respiratory tract and is responsible for economic losses due to mortality, treatment costs. BRDC has a multifactorial factors such as infectious agents, host, and age, breed, genetic, nutrition, climate, commingling of animals and especially crowded transport. Especially transportation has a close relationship with an increased risk of BRDC because it is responsible to weaken immune system. Therefore, Mannheimia haemolytica, Pasteurella multocida, Histophilus somni, Mycoplasma bovis, and Bibersteinia trehalosi are most common BRDC pathogens that are still tried to develop diagnostic techniques and control strategies. In addition, good nutrition, vaccination and reducing stress factors, complying with biosafety rules and ensuring adequate air circulation are important factors in the control of respiratory system disease in cattles.*

### INTRODUCTION

Bovine Respiratory Disease Complex (BRDC), is a significant health problem for all types and all ages of cattle in the dairy and livestock industry. However, the availability and use of numerous vaccines against bovine respiratory pathogens and newer antibiotics, and an improved understanding of the etiology of BRDC, from pneumonia to death, it remains a major cause of morbidity, mortality and economic losses in industries. Also, BRDC treatment is a significant expense for producers, with annual BRD costs in the United States estimated at 800-900 million dolar<sup>1,2</sup>.

Respiratory disease usually occurs within 6 to 10 days after multiple stress factors such as shipping or commingling, with interstitial pneumonias often occurring 70 or more days later<sup>3</sup>. Multiple factors such as predisposing, environmental, and epidemiological can cause of BRDC. Especially epidemiological factors that several studies represented the bacterial pathogens as *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni*, *Mycoplasma bovis*, and *Bibersteinia trehalosi*<sup>4,5</sup>. Firstly, researcher presented BRD complex pathogens only *Mannheimia haemolytica* (formerly *Pasteurella haemolytica*), and *Pasteurella multocida* since then, *Histophilus somni* (formerly *Haemophilus somnus*), *Mycoplasma bovis*, and, most recently, *Bibersteinia trehalosi* (formerly *Pasteurella trehalosi*) have also been recognized as additional bacterial agents associated with severe bovine bacterial pneumonia. These bacteria are saprophytic in the respiratory tract of animals, but under stressful conditions (e.g., weaning, transport, or stress) and may become pathogenic and cause BRDC<sup>4</sup>. BRDC can occur in every age of cattles, including feedlot, dairy calves, nursing beef, post-weaned<sup>6,7</sup>. The role of BRD in morbidity and mortality rates may range 35-100%, 24-60% have been reported

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respectively in several studies<sup>8</sup>. Antibiotics is the key of treatment and 89% of sick cattle are treated but 33% of the cases, the treatment fails, resulting in additional treatment is required or animal death<sup>9</sup>. In this review we will focus on pathogenic bacteria in BRDC and how these pathogens develop pneumonia phenomena.

### A. Major BRDC Pathogenic Bacteria

**1. *Pasteurella* spp.:** *Pasteurella multocida* (*P. multocida*) is a pathogenic, Gram negative coccobacillary- to rod- shaped microorganism that belongs to the genus Pasteurellaceae. It is often found as normal oropharyngeal flora in animals and it can also be primary or opportunistic pathogen<sup>10-11</sup>.

*P. multocida* is divided into three subspecies, five capsular serogroups and 16 serotypes. Especially *P. multocida* serogroup A isolates are both bovine nasopharyngeal commensal, and pathogen for young dairy calves and cattles. This pathogen can be main component of Bovine Respiratory Disease Complex (BRDC), enzootic calf pneumonia and shipping fever of weaned, stressed animals<sup>11-13</sup>. *P. multocida*-induced pneumonia is associated with predispose factors such as environmental, epidemiological and stress factors (shipping, co-mingling, and overcrowding). Lung lesions of infected animals are characterized as an acute and subacute bronchopneumonia with pleuritis or without<sup>14</sup>. After proper clinical examination of the cattles suffered with septicemic or systemic pasteurellosis, animals shows clinical signs of increased body temperature, loss of appetite, depression, excessive salivation, edema of the head, neck, and brisket, and severe respiratory distress with foamy nasal discharge, leading to death. Acute form of septicemic pasteurellosis death will occur in less than 24 h. However 100% of all mortality rates are associated with acute sepsis manifest, treatment with antibiotics is possible in the early stages<sup>11,15</sup>.

**2. *Mannheimia* spp.:** *Mannheimia haemolytica* (*M. haemolytica*) is Gram negative, coccobacillary- to rod- shaped bacteria that previously belonged to the Pasteurellaceae family. *M. haemolytica* causes Mannheimiosis, shipping fever and pneumonic pasteurellosis tahta are most common respiratory diseases of cattles and is responsible for approximately 30% of all cattle deaths worldwide. It has been reported that of the 12 capsular serotypes of *M. haemolytica*, A1 and A2 are common all over the world and both colonize the upper respiratory tract of cattle

and sheep<sup>16</sup>. Although other serotypes such as A6, A7, A9 and A12 have been reported in the etiology of the disease, A1 is considered the most important cause of bovine mannheimiosis. Studies have reported that serotype 1 is found at a rate of 70.7% in individuals with respiratory system disease<sup>17,19</sup>. *M. haemolytica* occurs as part of the commensal nasopharyngeal microflora in healthy animals and can control the growth of bacteria in the nasopharynx. Also, few bacteria inhaled in aerosolized droplets are cleared by the host immune system. In stressed animals, *M. haemolytica* A1 can proliferate and reach high numbers in the nasopharynx and trachea, causing large numbers of bacteria to be inhaled and colonized in the lungs<sup>16-19</sup>. As known from Pasteurellosis, healthy animals are at risk in an enclosed environment during transport, under stress within the other conditions, this situation is similar in *Mannheimia* infections<sup>19</sup>.

**3. *Histophilus somni*:** *Haemophilus* spp. is pleomorphic, Gram negative rods or coccobacilli and obligate inhabitants of animals. *Histophilus somni* (formerly *Haemophilus somnus*) is “blood-loving,” because blood or blood factors were originally required to isolate these bacteria. Also nicotinamide adenine dinucleotide (NAD or NAD phosphate; V factor) or protoporphyrin IX or protoheme compounds such as hemin (X factor) or both are crucial for growing<sup>20-23</sup>. It is a complex disease in cattle characterized by septicemia, thrombo-embolic meningoencephalitis, polysynovitis, fibrinous pleuritis, myocarditis, otitis media, infertility, reproductive disorders, mastitis and suppurative bronchopneumonia. Among them, the system or tissue most affected is the lung parenchyma. Therefore, it is considered one of the most important bacterial agents of acute and chronic BRDC<sup>22</sup>. It can cause fibrinous bronchopneumonia with or without other respiratory pathogens. Severe consolidated areas occur in the lungs in cases of acute pneumonia due to *H. somni*. Interstitial pneumonia, characterized by infarct areas as a result of hemorrhage, thrombosis, occurs. Severe laryngitis and hemorrhagic tracheitis often accompany pneumonia in these animals. *H. somni* cannot survive long periods in the environment, colonize new hosts and transport by direct contact, asymptomatic carrier, contaminated fomites and inhalation<sup>22-24</sup>.

**4. *Mycoplasma bovis*:** Mycoplasmas are one of the two genera of the family Mycoplasmataceae, one of the three families of the class Mollicutes and are unique prokaryotes that lack a cell wall and have the smallest cell size microorganisms.

Mycoplasmas require the addition of animal protein, sterol component and DNA source to the medium. Typical colony structure appears as 'scrambled eggs' on the surface and deep into the agar<sup>25,26</sup>.

Clinically healthy animals can carry the agent in the mucosa of the nose, conjunctiva, mouth, intestine and genital tract without showing any signs. Respiratory problem, including pneumonia and pleuropneumonia, is the most common clinical manifestation of mycoplasmas in mammals and also arthritis, and tenosynovitis clinical signs in feedlot cattle. The agent is mainly located in the bronchoalveolar region in the respiratory tract and spreads to the environment in the form of cough and droplet infection<sup>27,28</sup>. Contaminated dust particles can also be a source of infection. Following the development of infection in the respiratory system, the disease spreads rapidly in the herd. The agent is found in the nasal discharge of animals within 24 hours following contact with a diseased calf. One week after the initial detection of the agent, *M. bovis* can be isolated from most animals in the herd. Depending on various stress factors, mycoplasmosis may form 7-14 days after the development of BRDC or shipping fever. *M. bovis* causes a variety of respiratory symptoms, but they are not ethiological specific; fever, loss of appetite, depression, hyperventilation, dyspnea, fever and can occur even in five day old young calves<sup>29-31</sup>.

## **B. Pneumonia Types of BRDC**

### **Suppurative Bronchopneumonia (Lobular Bronchopneumonia)**

Suppurative bronchopneumonia is common type of pneumonia of young dairy calves, and it is most often related with *P. multocida* infection. This is characterized bilateral and localization of the cranioventral lobes and presents with mucopurulent exudate flow of different color and consistency from the cross-section of the organ<sup>14,32,33</sup>. This type of pneumonia is mostly in the form of lobular consolidation and is therefore also called lobular pneumonia. Depending on the type of pathogen and the duration of the fire, the macroscopic image of the lung takes different forms. Generally, the lungs are hyperemic and edematous within the first 12 hours. After approximately 48 hours, consolidation and a hard consistency occur as neutrophils infiltrate the area. The hyperemic image disappears within 3-5 days and a gray-pink image occurs. In bronchopneumonias, the lungs are seen

macroscopically as flesh-colored and viscous; lesions are in the form of patches. Because of the exudate filling into the air spaces, the pieces taken from the lung do not float when thrown into the detection fluid<sup>14,32-34</sup>.

### **Fibrinous Pneumonia or Fibrinous Pleuropneumonia (Fibrinous Bronchopneumonia, Lobar Pneumonia)**

Fibrinous bronchopneumonia is typical of that produced by *M. haemolytica* and to a lesser extent *H. somni* and is the most common form of acute pneumonia in weaned, stressed beef cattle (shipping fever). The inflammation spreads rapidly until it covers the entire lobe. In general, fibrinous bronchopneumonia occurs in more severe lung injuries and is more severe, causing death of the animal. Clinical signs and death occur as a result of severe toxemia in approximately 30% of events. As with suppurative pneumonia, there are initially red areas of consolidation. After about 24 hours, the interlobular septum enlarges with edema and fibrin outflow; Thrombosis is seen in arterioles, venules and lymphatic vessels. Lung lobes take a marble appearance macroscopically<sup>32-34</sup>.

### **Caseonecrotic Bronchopneumonia:**

Chronic Mycoplasma infection especially caused by *M. bovis* pneumonia type is caseonecrotic bronchopneumonia. Cranial and medial lung lobes are more affected in caseonecrotic bronchopneumonia. Nodules containing caseous necrosis are found in the affected areas of the lung, often with consolidated lung tissue adjacent to these areas. Caseonecrotic nodules can range in size from mm-cm<sup>35-36</sup>. Generally, nodules of this type are circular, white, dry and easily fragmented nodular lesions that protrude from the pleural surface. Caseous lesions are sequestered over time and can spread to the entire lobe and form bronchiectasis. Especially in cases where coinfection with other BRDC bacteria occurs, these areas of caseous necrosis may become a liquid, pus-filled structure instead of dry fissile material<sup>37,38</sup>.

## **C. BRDC Prevention and Treatment Strategies**

Vaccination: Vaccination of the cattles against to respiratory bacterial infection to enhance immunity by increasing antibody concentration and it has been proven for dissemination of the immunity<sup>39</sup>. At the same time, the scientific community continued to develop and innovate diverse and complex vaccine designs to activate various arms

of the immune system and combat pathogens virulence mechanisms such as modified-live viral vaccines (MLV), killed virus (KV) vaccines or a combination of BRD-associated bacteria bacterin/toxoids that are commercially available against BRD-associated viruses and bacteria<sup>40</sup>. Especially for beef cattles, studies highlighted that vaccination of calves against to *Mannheimia haemolytica*/*Pasteurella multocida*, may reduce the incidence of morbidity and mortality<sup>41</sup>. Interestingly, some researchers claimed that vaccination efficacy against *Mannheimia haemolytica*, *Pasteurella multocida*, and *Histophilus somni* is inconsistent<sup>42</sup>.

**Antibiotic therapy:** In the feedlot industry, the use of antibiotic therapy represents a vital management activity to control and treat BRD<sup>43, 44</sup>. Generally, third-generation ceftiofur and fourth-generation cefquinom are most commonly preferred in the treatment and florfenicol, oxytetracycline, tilmicosin, tulathromycin, chlortetracycline and chlortetracycline plus sulfamethazine are used for metaphylaxis in the feedlots<sup>43,44</sup>. Also it should be noted that, after using long-acting oxytetracyclines if there is no sign of improvement in 5-10% of the sick animals within the first 24 hours, the treatment should be continued with tilmicosin or florfenicol. Antibacterial choices for treatment may be diverse for cattles. Sulfonamides are not the first drugs to be considered in the treatment of severe respiratory system infections. They show a bactericidal effect by preventing the formation of the cell wall in bacteria. Due to their mechanism of action and spectrum, they are mostly preferred in acute events and upper respiratory tract infections. Also erythromycin, tylosin and gamithromycin are used in the treatment due to their ability to accumulate in the respiratory system at high concentrations. Fluoroquinolones show synergistic activity with beta-lactams, and antagonist activity with macrolides and phenicols. Although enrofloxacin and ciprofloxacin are well known antibiotics, danofloxacin penetrates lung tissue better than enrofloxacin; veterinarians has given priority for this reason<sup>43-45</sup>.

**Biosecurity:** Biosecurity in cattle breeding covers a series of measures taken to prevent the transmission of epidemic disease factors to animal herds at the enterprise, regional or national level. The term biosecurity is particularly relevant to the protection and safety of dairy cattle against respiratory diseases<sup>46</sup>. Biosecurity consist important routine applications such as farm management, daily care, feeding, health controls<sup>47</sup>. Measures to be implemented to protect both animals and employees in the enterprise include biosecurity-based practices that prevent

the pathogen from entering the herd<sup>46</sup>. These practices are part of the often recommended measures to control many infectious diseases, as they reduce the risk of disease spreading. The producers and veterinarians should be carried out the biosecurity management more rigorously applied for the reduction of respiratory disease prevalence in cattle, including (1) strategic vaccination, (2) calf biosecurity, (3) housing ventilation, (4) commingling and animal contact, and (5) virus control<sup>46</sup>.

## CONCLUSION

As a result of all this detailed evaluation of BRDC, precautions must be taken on biosecurity practices, production management strategies for minimizing pathogen shedding, exposure, and transmission respiratory disease in cattles. In addition good nutrition, vaccination and reducing stress factors, complying with biosafety rules and ensuring adequate air circulation were important factors in the control of respiratory system disease in cattles. Various combinations of these control measures should be adapted to individual farms to help decrease the morbidity and mortality attributed to respiratory disease.

## Conflict of interest statement

The authors declare that they have no conflicts of interests.

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## TREATMENT OF A MANDIBULAR FRACTURE IN A GRAY HERON

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### ABSTRACT

#### Keywords

Beak,  
broken,  
fixation,  
grey heron

*Trauma in poultry can be caused by attacks from other animals, foreign objects penetrating the body, getting trapped in cages, injuries caused by hunters, and hitting hard objects during flight. In literature, non-displaced fractures caused by beak injuries in poultry have been reported to have a good prognosis. Cases of fractures with displacement between fragments can also be treated, but situations where complete anatomical reduction cannot be achieved or occlusion disorders that may occur during the postoperative period can cause misalignment of the beak, feeding difficulties in the future, and difficulties in grasping during other daily activities. This study aims to present the treatment of a mandibular fracture in a gray heron.*

### INTRODUCTION

Traumas in birds may occur due to attacks from other animals, penetration of hard foreign objects such as wire or metal, entrapment in cages, injuries caused by hunters, and collisions with hard objects during flight. In the literature, non-displaced fractures related to beak traumas in birds have been reported to have a good prognosis. Cases of fractured fragments with displacement can also be treated, but situations where full anatomical reduction cannot be achieved or occlusion disorders that may occur during the postoperative process can lead to improper alignment of the beak, difficulties in feeding in the future, and difficulty in grasping during other daily activities. The prognosis for multi-piece fractures is often poor due to the possibility of infection and potential bone necrosis. Additionally, in cases where vascularization is damaged, ischemic necrosis of the bone and surrounding soft tissues may occur. Prognosis for fractures near the joint is poor, so achieving full anatomical reduction is more important in treating these fractures. Surgical interventions can also lead to iatrogenic damage and consequently a poor prognosis. The aim before treating the fracture should be to reduce pain, control any bleeding in the fractured area, and improve the general condition of the animal. If the animal cannot feed due to the fracture, hand feeding or placement of an esophagostomy tube should be considered. Once the animal's condition has been stabilized through these measures, surgical intervention can be initiated. In cases of material loss lesions in the beak, filling procedures can be performed using acrylic materials after the affected area is cleaned. In cases of mandible and maxilla fractures, fixation of the fractured fragments can be achieved using pins and cerclage wires. Tissue adhesives can also be used in small cracks and fractures in the beak. Most birds can easily adapt to the treatment method applied and continue their lives<sup>1,2,3,4,5,6,7</sup>. This study aims to present the treatment applied in a grey heron with a mandible fracture.

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## CASE REPORT

A grey heron bird found accidentally in nature was brought to our clinic by the officials of the Sivas Provincial Directorate of Forestry Nature Conservation and National Parks Unit. During

the clinical examination, an abnormal angle and gap between the maxilla and mandible were detected, which was found to be caused by bilateral mandibular fractures (Figure 1a and 1b). Food and water restriction were applied during the preoperative period.



Figure 1. Clinical view of mandibular fracture in the grey heron bird, a) from the left side, b) from the right side.

Sevoflurane was used for anesthesia of the grey heron. After general anesthesia was achieved, the patient was fixed on the operation table in a lateral position using medical adhesive tape. The

patient was monitored. The area was prepared according to aseptic and antiseptic rules, and covered with sterile drapes, leaving the mandible exposed (Figure 2).



Figure 2. Sterile draping of the area.

The superficial curettage of the fracture line was performed using a No. 11 blade. A 0.8 mm diameter Kirschner wire was inserted caudally from the fracture line using a low-speed medical drill (Figure 3a). After the free end of the pin exited the mandibular canal, it was disconnected from the drill and the same procedure was applied

with a contralateral Kirschner wire of the same diameter. The free ends of the pins were then removed from the caudal surface of the mandible on both sides (Figure 3b), and the fracture was reduced and pushed cranially using a retrograde technique inside the mandible.

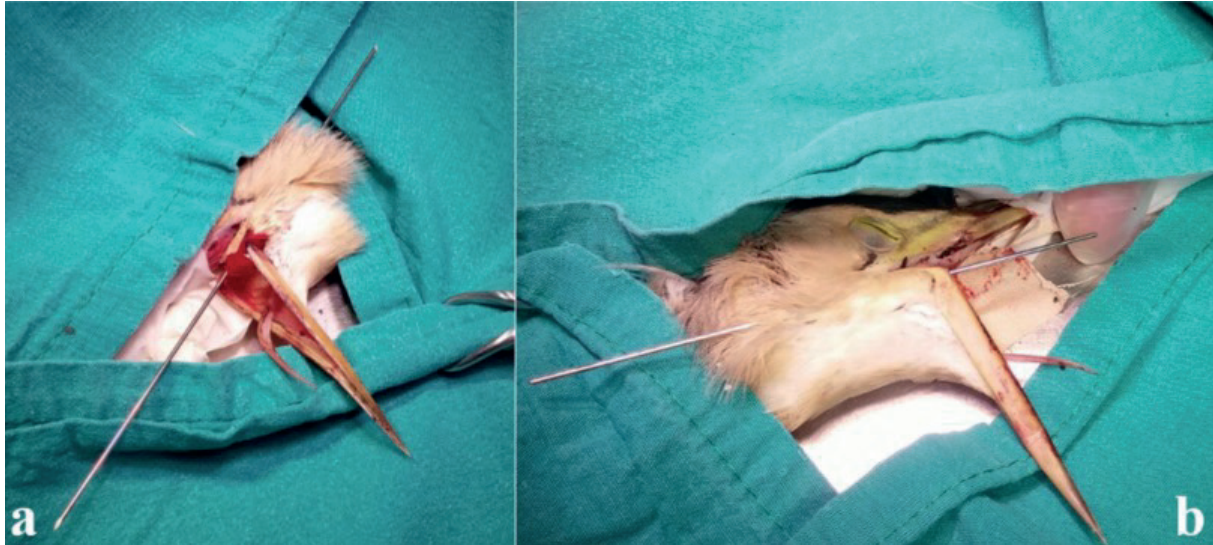


Figure 3. a) Kirschner wire application to left and b) right Corpus mandibulae.

The occlusion of the beak was checked (Figure 4a and 4b). After confirming that the occlusion

was achieved, anesthesia was discontinued and the patient was awakened.



Figure 4. a and b) Evaluation of the occlusion of the beak.

After evaluating the vital parameters and ensuring that they were at physiological levels, the patient was handed over to the authorities of the Nature Conservation and National Parks Department. Feeding through a feeding tube was recommended. The patient returned for a post-

operative examination 10 days later and was found to be in good general condition. Control radiographs were taken, and the patient was handed over to the authorities again (Figure 5a and 5b). The patient could not be followed up on in the subsequent period.

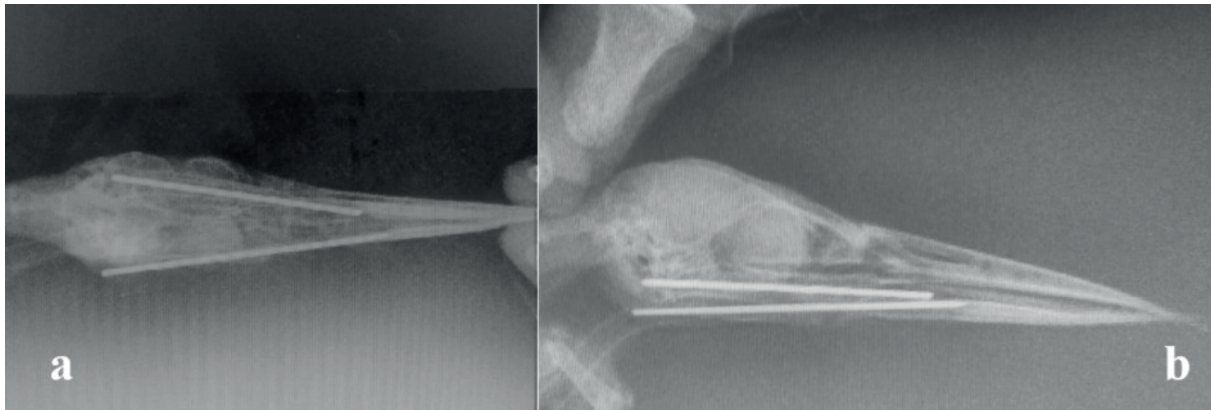


Figure 5. 10th day postoperative control radiographs of the grey heron in a) ventro-dorsal, b) latero-lateral plane.

## DISCUSSION

Among the surgical treatment techniques applied in the beaks and bone fractures of winged animals, external fixation applications occupy an important place. Obtaining the desired stabilization can be difficult due to the thinness of the bones and beak during the application of such implants. In addition, pin site infection is one of the most common complications encountered after the application of external fixators<sup>5</sup>. The treatment of the mandibular fracture that occurred in the grey heron bird, which was brought to the clinic after being found in nature, was performed by applying Kirschner wire intramedullary into the beak. Due to the location of the fracture and the thinness of the beak, the pin was applied retrogradely into the mandibular medulla to prevent possible stress fractures that could occur in the future by piercing the beak with multiple pins. No complications were observed during the postoperative follow-up period up to day 10, during which the patient could be monitored.

Before any corrective surgery is performed on the beak of any bird species, clinicians should always assess whether growth plates are closed or not; however, clinical evaluation may be challenging<sup>9</sup>. In the grey heron brought to our clinic, a fracture was detected in the mandibular corpus as a result of clinical and radiological examination, and an application that could cause growth deformities in the beak of the grey heron bird was avoided.

Although no clear percentage or prevalence can be determined, mandibular fractures in the lower beak in Psittacine birds, songbirds, and raptors, and upper or lower beak (mandible and premaxilla) fractures in long-billed birds (such as storks, herons, and ibises) are common injuries. The beak of water birds such as ducks, geese, and swans is thin and soft, which can lead to higher fracture rates due to traumatic events<sup>8</sup>. The grey

heron bird brought to the clinic is a long-billed bird, and the mandibular fracture that occurred was thought to be due to hunting or gripping.

Malocclusion or misalignment of the mandible disrupts normal beak function and endangers the ability to eat normally. In such cases, encountering feeding problems is inevitable. If the resulting malocclusion cannot be corrected, euthanasia must be considered as an alternative outcome<sup>5</sup>. The treatment of the mandibular fracture detected in the grey heron bird that is the subject of the study was performed by applying Kirschner wires into the mandibular medullary canal. After reduction, it was evaluated whether the beak could open and close properly to perform its physiological function. In addition, it was observed that occlusion was successfully achieved.

For predatory birds living in nature, the use of the beak is very important for survival. The treatment of mandibular fractures that may occur in predatory birds with thin and long beak structures, such as herons, using Kirschner wires, can be evaluated as an alternative treatment method.

## Conflict of interest statement

The authors declare that they have no conflicts of interests.

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