Unrepaired defects of the mandible, including the angle, ascending ramus, and posterior body, leave a significant deformity, both functional and aesthetic. The muscles of mastication pull the remaining mandible into a lingual relationship with the maxillary teeth, rendering the remaining teeth functionless. The soft tissues of the tongue and larynx lose their support, resulting in difficulty with oral competence and intelligible speech (Figure 34.1).

The goals of mandibular reconstruction are to provide a reliable restoration of hard and soft tissue, enhancing both cosmesis and function. Due to its exceptional utility for restoration of the mandible, the three-dimensional reconstruction plate has become the cornerstone of the operative reconstructive strategy for these defects (Figure 34.2). The plate functions as a template of the mandible. It also helps to maintain the orientation and position of the remaining native mandibular segments. Consequently, proper occlusal relationships are preserved. In addition, the plate provides an excellent mechanism for the fixation of vascularized bone grafts.

Vascularized bone transferred by microvascular techniques has become the gold standard for reconstruction of the mandible. Initially, many centers were reluctant to use microvascular transfer, fearing the procedure to be unreliable due to the complex nature of the surgery. Ironically, this “complicated” technique is actually the most dependable method of mandibular reconstruction currently available. Success rates of approximately 95% for microvascular head and neck reconstructions are routinely reported in the literature.1–3

There are, however, circumstances in which it may not be imperative to restore bone. This may stem from either the location or extent of the mandibular defect or from variables related to the patient’s overall health or prognosis. AO reconstruction plates may be used alone or in combination with soft tissue flaps to provide restoration of the mandible. These alternative techniques allow immediate function with minimal donor deformity in patients whose physical status mitigates against a lengthy surgical procedure. Reconstruction of the mandible solely with an AO plate should likely be limited to lateral or posterior defects due to the excessively high rate of plate exposure when plates are used without vascularized bone on anterior repairs. Reconstruction of 31 patients comparing plate fixation alone to immediate vascularized bone-graft repair demonstrated that while plate reconstruction had an overall success in 15 of 20 patients (75%), the failure rate for anterior plates was 76%. This contrasts with a 100% success rate for the vascularized bone grafts, 6 of 11 of which were for anterior defects.4

Types of Flaps in Common Use

Historically, a number of different vascularized bone flaps have been used for mandibular reconstruction, ranging from rib5,6 to second metatarsal.7 The most commonly used osteocutaneous flaps include the radial forearm, incorporating a portion of radius, the scapula, iliac crest, and fibula. All these flaps can provide a skin paddle, which may be needed for intraoral lining or external skin coverage. The particular flap used is dependent upon the specific needs of the reconstruction.

The radial forearm flap based on the radial artery and the cephalic vein provides a dependable pedicle and a thin, potentially sensate soft tissue. However, pathologic fractures of the radius and a significant functional and aesthetic donor site deformity can occur.8–10 The scapular flap has a long pedicle from the circumflex scapular artery, which supplies a large amount of dependable skin for harvest. The skin paddle may be oriented independently of the bone stock, giving added versatility.11 However, the available bone may be thin and somewhat limited, especially in female patients.12,13 Most significantly, the lateral positioning of the patient necessary for flap harvest precludes simultaneous dissection with the ablative team, greatly increasing the operative time. We have most commonly employed the fibular flap, which is based on the peroneal vessels. The fibula flap provides excellent bone stock, minimal donor site deformity, and when a small cuff of muscle is included in the dissection, it is a reliable skin paddle as well.14,15 The iliac crest is a large bone with a bulky skin/soft tissue paddle. The donor site is often painful, but
this flap has shown excellent results for bony restoration in patients with osteoradionecrosis.16–18

Preoperative Evaluation

A thorough evaluation of the patient in preparation for the reconstructive surgery is essential in obtaining reliable results. Issues that require assessment include:

1. The size and location of the defect
2. The composition of the defect
3. Status of recipient vessels
4. Overall health and nutritional status of patient
5. History of smoking

Fibular Free Flap

The fibular flap is our flap of choice for mandibular reconstruction. The operative procedure we employ will be described in detail. The advantages of the fibular flap include:

1. The harvest is straightforward and may proceed simultaneously with the ablative part of the operation
2. The bone stock is of high quality and excellent length
3. The segmental periosteal blood supply allows for multiple osteotomies
4. The skin paddle is reliable if the perforators are protected by including a cuff of soleus muscle in the dissection
5. Donor site morbidity is low

If skin is not required for the reconstruction, the fibula is harvested from the ipsilateral leg. The contralateral leg is used if both skin and bone are needed. A posterior mandibular reconstruction requires creation of a ramus. Use of the proximal fibula mandates pedicle location at the neoangle, which is essential for flap inset and vessel anastomosis. Conversely, the distal fibula is used when a proximal reconstruction is performed, as the vessels are ideally positioned.

Operative Procedure

Occlusion should be set prior to resection, using intermaxillary fixation via arch bars. Both teams begin the operation concurrently. The ablative team is positioned at the patient’s head, while the reconstructive team is harvesting the flap from the leg. The ablative surgeon notifies the reconstructive team once the mandible is exposed and ready for resection. The proposed sites for the bone cuts are marked with an oscillating saw penetrating only the outer cortex. Prior to