

Surgical Treatment of Hallux Valgus

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Abstract

Hallux valgus deformity is an often deformity in which first metatarsophalangeal joint is subluxated due to the lateral deviation of thumb and medial deviation of metatarsal bone. As deformity progresses, it results in function and uniformity loss, with lateral displacement of thumb and deformity of claw toe and hammer toe. Shoes' pressure on bunion area causes its inflammation and pain. Conservative and surgical treatment methods are used for the treatment of Hallux valgus deformity. According to the results of our study, which we obtained through soft tissue corrective procedures and bunionectomy applied under local anesthesia to 86 patients with Hallux valgus at different times, patients could walk within a short period of time, wear shoes comfortably, and their pains decreased considerably.

Keywords: Hallux Valgus, Chevron Osteotomy, Deformity.

1. Introduction

Hallux valgus (HV) deformity is an often deformity in which first metatarsophalangeal joint is subluxated due to the lateral deviation of thumb and medial deviation of metatarsal bone (Mann & Coughlin, 1981; Anaforoğlu, 2012). Hallux valgus (HV) can also be defined as a deformity in which many a pathology such as lateral deviation of thumb and medial deviation of first metatars is present with the static subluxation of first metatarsophalangeal (MTP) joint (Coughlin, 1996),[Figure 1].

Figure 1: Hallux valgus early radiography.

The angle made by the line that knits condyles on proximal side of proximal phalanx to the long ax of proximal phalanx is called (PFEA), and hallux valgus interphalangeus is evaluated by this angle. This deformity occurs in cases where the line is laterally deviated (Akçeli et al., 2011; Arıncı & Genç, 2002). This situation is mostly accompanied by a bone process on medial side of 1. Metatarsal head called “bunion” and a soft tissue pain (Anaforoğlu, 2012). Bunion is a thickened bursan structure that is located on medial process and demonstrates swelling. Due to irritation of dorsal cutaneous nerve on thumb, pain is mostly felt in this area (Akçeli et al., 2011). As deformity progresses, it results in function and uniformity loss, with lateral displacement of thumb and deformity of claw toe and hammer toe (Spink et al., 2008). Shoe’s pressure on bunion area causes its inflammation and pain (Anaforoğlu, 2012; Thomas & Barrington, 2003).

Hallux valgus [Figure 2] is a common foot deformity in adults, which is seen more often in women (Akman, 2009). Joint surface of metatars head is laterally deviated, which is determined by distal metatarsal joint angle (DMJA). Its normal value is *10 degrees*. Another anatomic variation is the lateral deviation of proximal phalanx’s joint surface, and this is also determined by proximal phalangeal joint angle. Its normal value is *8 degrees*. If these angles exceed normal values, phalangeal or distal metatarsal osteotomy should be preferred (Akçeli et al., 2011; Özkayın & Kapubağlı, 2007; Doğan & Üzümcügil, 2007). While HV deformity prevalence varies in different populations, it was reported to be 21-65% (Crawford et al., 1995; Cho et al., 2009). It was found that HV prevalence in females is more than males with a rate of 9:1, and it increases with age (Cho et al., 2009; Dunn et al., 2004). While HV deformity is evaluated as “there is” or “none” by observation, inventories were developed to classify severity (Garrow et al., 2001; Roddy et al., 2007). The most commonly used method in evaluating severity is to measure angular degree (Coughlin & Freund, 2001; Coughlin et al., 2002). It was reported that deformity negatively affects balance, walking and weight bearing (Anaforoğlu, 2012; Menz et al., 2005; Wilson, 1988).

Figure 2: Hallux valgus early period radiography.

Hallux valgus; (Wilson, 1988; Giannetras, 1973)

- Is a valgus deformity caused by MTP joint of foot thumb,
- There is varus angling on first metatars,
- Oblique variations of metatarsocuneiform (MTC) joint may occur,
- Medial of metatars head extends due to new bone formation and is diverged from sagittal trough by joint [Figure 3],
- Sesamoids are laterally subluxated or luxated.
- There is contracture in capsule and ligaments at MTP joint lateral, and laxity at medial,
- Thickening and bursan formation is seen in soft tissues on medial exostosis,
- Abduktor hallucis tendon stretches weakens,
- Thumb is in inner rotation,
- There is contracture in abductor hallucis tendon,
- Long extensor and flexor tendons are laterally dislocated,
- Degenerative changes in joint occur in time [Figure 4],
- Other pathology and deformities are seen together on forefoot (Sungur et al., 2006).

Figure 3: Hallux valgus and medial bone formation appearance in direct radiography.



Figure 4: Hallux valgus and metatarsophalangeal arthrosis appearance in direct radiography.



- Varus deformity of first metatars (metatarsus primus varus)
- Exophytic extension on medial side of metatars distal edge (medial process)

Hypertrophy and inflammation of bursae on medial process (bunion). While hallux valgus deformity is defined as outer angling of thumb by its name, it is a complex deformity that includes various pathologies on the first line of foot (Karlı et al., 1991; Altınmakas et al., 1991). This set of pathologies;

- Lateral deviation of thumb
- Contraction of metatarsophalangeal joint capsule
- Subluxation of sesamoids under metatars head
- Formation of a deformity similar to hammer toe finger on second finger with a rate of 15-20%
- Forefoot extension (foot instep)
- Degenerative osteoarthritis
- Callosity (Doğan et al., 2007; Karlı et al., 1991; Altınmakas et al., 1991).

1.2. Etiology

The main factors that affect hallux valgus development are genetic predisposition, use of unsuitable shoes, and anatomic and structural abnormalities (Coughlin, 1996; Akçeli et al., 2011; Özkayın & Kapubağlı, 2007).

When we list etiology under two sections as extrinsic and intrinsic reasons (Akçeli et al., 2011; Doğan et al., 2007; Sungur et al., 2006)

A Extrinsic reasons:

- 5) Shoes (Sungur et al., 2006).

B Intrinsic factors:

- 1) Heredity
- 2) Pes Planus
- 3) Metatarsus primus varus
- 4) Length of first metatarsal head
- 5) Metatarsocuneiform joint hypermobility
- 6) Achilles contracture (Arıncı & Genç, 2002; Akman, 2009)
- 7) Muscle imbalance: In studies regarding an imbalance between extrinsic and intrinsic muscles in etiology, it was shown that EMG test results of intrinsic muscles are weak.
- 8) Long thumb
- 9) Neuromuscular disorders (Giannetras, 1973; Skinner, 1995; Kato & Watanabe, 1981)
- 10) Inflammatory and metabolic diseases of first MTP joint (Giannetras, 1973; Skinner, 1995; Adelaar, 1997; Alexander, 1990).
- 11) Second finger amputation (Adelaar, 1997; Coughlin & Mann, 1999)
- 12) Reasons except first MTP joint that causes pronation on foot (Coughlin, 1996; Adelaar, 1997; Coughlin & Mann, 1999; Skinner, 1995; Başkır et al., 1984).
- 13) Cystic degeneration

1.3. Classification

As it is important in treatment planning, hallux valgus classification should be known well. Hallux valgus deformity has been classified by many researchers. Below is the most commonly used classification

1.3.1. Mann Coughlin Classification (Coughlin & Mann, 1999).

1. Light Bunion Deformity: Hallux valgus angle is less than 20°, a part of deformity may be caused by hallux valgus interphalangeus. First MTP joint is adaptable, and inter-metatarsal angle is less than

11°. These patients generally have a sharp back in dorsomedial and complain about painful medial process. Although sesamoids are seen having an anatomic position, nearly 50% subluxation of fibular sesamoid can sometimes be found.

2. Medium Bunion Deformity: There is subluxation in first MTP joint. Hallux valgus angle is between 21°-40°. Thumb can apply some pressure on second finger. There is pronation in thumb.

3. Severe Bunion Deformity: Hallux valgus angle is over 40°. Thumb is dislocated under or above second finger, and it is on medium pronation (Akman, 2009; Sungur et al., 2006; Coughlin & Mann, 2007).

2. Methods

Hallux valgus is treated by two methods: conservative and surgical treatment methods. In the treatment of hallux valgus, whether conservative or surgical treatment method will be used should be decided first. Firstly, conservative methods should be tried as most of the patients will avoid surgery. However, in cases with severe and painful deformity, if it is believed that conservative treatment will not be useful, surgical treatment can be used immediately (Akman, 2009; Doğan et al., 2007).

A. Conservative Treatment

If deformity has not progressed much in patients with hallux valgus, conservative methods can be tried. Main pathological anatomy, reason of the pain, and ways to decrease or eliminate pain should be explained. Typically, the first step of conservative method is to change the type and size of shoes (Coughlin & Mann, 2007). Especially wearing pointy-toed, heeled shoes should be prevented in woman patients; shoes made of soft materials that can be extended adequately should be preferred in order to decrease pressure on the medial process. For patients who are unwilling to surgical intervention, shoes that are produced for the patient to decrease pressure on pressure points can be preferred (Akçeli et al., 2011; Akman, 2009; Doğan et al., 2007; Coughlin & Mann, 2007).

Shoe modifications such as eliminating pressure points and applying extension can also be useful. To decrease symptoms; interdigital spool, hallux valgus night atel, hallux valgus day atel, and bunion pillow can be used (Sungur et al., 2006; Coughlin & Mann, 1999; Skinner, 1995; Coughlin & Mann, 2007; Bryant et al., 2000; Gentili et al., 1996).

B. Surgical Treatment

Surgical treatment should be applied to patients who do not respond to conservative methods. However, the patient should be informed about potential risks, complications and expectations (Doğan et al., 2007).

Process of deciding surgical treatment for hallux valgus deformity starts with recognizing that every deformity is not the same (Sammarco et al., 2007). Selected surgical technique should recover all components of the deformity: These are medial process, increased valgus angling in proximal phalanx, increased first and second metatarsal angle, MP joint adaptation, sesamoid subluxation, thumb pronation, normal biomechanics of 1.metatarsophalangeal joint, and elimination of pain. In the meantime, selected surgical method should not damage the function of forefoot. In planning surgical method to recover hallux valgus deformity, main complaints of the patient as well as physical and radiographic examination findings will help decide surgical intervention. Among the options are metatarsophalangeal soft tissue reconstruction, 1.metatars osteotomy from distal or proximal, proximal phalangeal osteotomy, medial cuneiform osteotomy, metatarsophalangeal joint arthrodesis, resection arthroplasty, or combination of all (Doğan et al., 2007). First surgical treatment indication in hallux valgus is pain. In forefoot, stability is more important than aesthetics; cosmetic operation may result in a good-looking but painful pain. The aim of surgical intervention is to recover thumb valgus deformity and first metatars varus deformity, eliminate medial process on the first metatarsal head, protect the motion and functions of first MTP joint (Sungur et al., 2006; Weinfeld & Schon, 1998).

In deciding surgical treatment in hallux valgus, not only graphies but also clinical complaints of the patients should be considered.

What should be considered apart from deformity in graphies are:

1. Painful bursitis.
2. Increased hallux valgus deformity.
3. Increased forefoot breadth and difficulty in wearing shoes.
4. Secondary deformity formation in second and fifth fingers.
5. Pain caused by shoe pressure on first MTP joint medial.
6. Aesthetic appearance.
7. Increased pressure on the inner edge of thumb nail caused by medial rotation (Wilson, 1988; Sungur et al., 2006; Saxena, 2000; Weissman, 1989).

In surgical deformity, state of first metatarsophalangeal joint should be detected. To this end, whether joint is adaptable or inadaptible or subluxated is considered. In an adaptable metatarsophalangeal joint, proximal phalanx is not subluxated on metatarsal head. Therefore, theoretically, proximal phalanx cannot be rotated on metatarsal head, if this is done, the joint becomes inadaptible. Although there are some exceptions like in cases where distal metatarsal joint angle is clearly deviated towards lateral, pain on medial process can be complained by patients with an adaptable joint. By following the procedure below, satisfactory results can be obtained in patients with an adaptable joint:

1. Chevron intervention.
2. Distal soft tissue intervention
3. With excision of medial process, Akin intervention.

Surgical treatment methods are analyzed under 7 main groups.

- 1) Medial capsulography operations with bunionectomy
- 2) Arthroplasties:
 - a. Phalanx resection
 - b. Metatars resection
 - c. Prosthesis to change joint surfaces
- 3) Soft tissue operations and tendon transfers
- 4) Osteotomies:
 - a. Distal metatarsal varus osteotomies without capsulography
 - b. Proximal metatarsal shift osteotomies with capsulography
 - c. Basal phalangeal varus osteotomies
- 5) Arthrodesis operations
- 6) Combined operations
- 7) Tarsometatarsal area and cuneiform operations (Sungur et al., 2006)

Below is the set of hallux valgus treatment according to adaptable and inadaptible joint (Coughlin & Mann, 2007; Sammarco & Idusuyi, 2001).

Adaptable Joint

- Metatarsal osteotomy - distal or proximal: Chevron, dome, transverse, closed wedge
- Distal soft tissue release
- Proximal phalangeal osteotomy (in selected cases)

Inadaptible Joint

- Inter-metatarsal angle $<15^\circ$, Hallux valgus angle $<30^\circ$
 - Distal Chevron osteotomy (age <60)
 - Mitchell intervention
 - Distal soft tissue intervention as isolated or with proximal or distal metatarsal osteotomy, bunion excision

- Inter-metatarsal angle $>15^\circ$, Hallux valgus angle $<40^\circ$
 - Distal soft tissue intervention as isolated or with proximal or distal metatarsal osteotomy
 - Bunion excision
 - Mitchell or Sharf osteotomy
 - Inter-metatarsal angle $>20^\circ$, Hallux valgus angle $>40^\circ$
 - Distal soft tissue intervention as isolated or with proximal metatarsal osteotomy and bunion excision
 - Metatarsophalangeal joint arthrodesis
 - Resection arthroplasty (in selected cases)
 - Hypermobile first metatarsocuneiform joint
 - First metatarsocuneiform joint fusion and distal soft tissue4 intervention
 - Degenerative joint disease
 - Metatarsophalangeal joint fusion
 - Resection arthroplasty
 - Resectional arthroplasty
 - Implant arthroplasty (rarely indicated) (Akçeli et al., 2011; Akman, 2009)
- If there are situations to contradict with surgical operation;
1. Inadequate peripheral circulation is absolute contradiction.
 2. Recent sepsis (within pre-op 3 months).
 3. Uncontrolled Diabetes Mellitus.
 4. Peripheral neuropathy relative contradiction (Wilson, 1988; Sungur et al., 2006).

2.1. Implementation

86 patients who were treated at different times were included in our study [Figure 5]. All of our patients have medium bunion deformity according to Mann Coughlin classification. 71 of our patients are female, and 15 are male. Age average is 51.8. Our patients generally applied for pain on foot thumb (increasing especially with movement), difficulty in wearing shoes, and aesthetical concerns. They are those for whom conservative practices were not useful. All of them were diagnosed by physical examinations and bilateral radiographic evaluations. There was no situation in our patients to contradict with surgical interventions.

Figure 5: Bilateral hallux valgus appearance in direct radiography



Feet of our patients were sterilized and covered. Local anesthesia was administrated to thumb and bunion periphery. Longitudinal incision was administrated from 1.metatarsophalangeal joint medial to bunion mass proximal. Osteophytic formations in bunion mass, bursal tissue and metatarsal head were resected totally. With mini incision between 1 .and 2.finger, adductor tenotomy and lateral capsulotomy was made. Medial capsule placation was made, and the finger was pulled to its anatomic ax. Following bleeding control, skin was covered by subcutaneous primary 3/0 vicryl. Tampon pads

were placed between post op 1. and 2. finger to prevent lateral movement of the finger, and bandaging was made to medialize functional finger.

All of our patients were discharged after the procedure and were allowed to walk with partial load. Their functional medical dressing and bandage were kept for post op 3 weeks. All of our patients used silicon spool between fingers until post op 6. week. It was found that at 6. week, their finger functions got better, initial concerns were eliminated, they could wear shoes comfortably, their pain stopped, and walking improved. Our patients were not allowed to wear heeled shoes until post op 4. months.

3. Discussion

Hallux valgus (HV) can be defined as a deformity in which there is much pathology including lateral deviation of thumb and medial deviation of first metatars due to static subluxation of first metatarsophalangeal (MTP) joint (Coughlin, 1996). This situation is mostly accompanied by a bone process on medial side of 1. metatarsal head called "bunion" and a soft tissue pain (Anaforoğlu, 2012). The main factors affecting hallux valgus development are genetic predisposition, use of inappropriate shoes, and anatomic and structural abnormalities (Coughlin, 1996; Akçeli et al., 2011; Özkayın & Kapubağlı, 2007). Conservative methods should be tried first for treatment as most of the patients will avoid surgical treatment. However, in cases with severe and painful deformity, if it is believed that conservative treatment will not be useful, surgical treatment can be used immediately (Akman, 2009; Doğan et al., 2007).

Dorsomedial part of medial capsulography should not be plicated excessively. As it will cause a problematic neuroma, it should be careful not to traumatize dorsomedial cutaneous nerve on thumb. Minimum subcutaneous dissection should be made around medial process, and skin tension should be avoided. An active physical therapy program should be initiated to gain MP joint movement. Once diagnosis ends, passive dorsiflexion and active plantar flexion should be started. Other finger deformities beside hallux valgus should also be treated properly. It should be ensured that the patient wear shoes as he/she wishes at postoperative period (Arıncı & Genç, 2002; Kaplan et al., 1990).

Through soft tissue corrective and bunion resection operation applied under local anesthesia to 86 patients with medium hallux valgus without admission to hospital, we provided improvement in our patients within a short period of time (6 weeks).

In our patients, pain complains and aesthetical concerns were eliminated, they could wear shoes comfortably and started to walk.

Their social and working life were not affected thanks to outpatient intervention and recovery period they had post op.

Hallux valgus is common foot deformity, which is seen more often in women (Akman, 2009). Due to its high prevalence, there is continuous need for studies including several practices. That our study was conducted with one method is a disadvantage in this regard. We believe that our patients being not at advanced ages affected that recovery period was short and no complications were seen.

4. Conclusion

Hallux valgus is not simple, but a complex deformity where there is much pathology. While it is easy to recognize, it is important to choose the best and effective treatment for the patient and examine him/her carefully in detail. In conclusion, hallux valgus deformity should be recovered. Here, it is reasonable for MP angle to be 10°_15°. Forefoot should be narrowed, and bunion pressure should be eliminated. Sesamoid displacement should be improved, and sesamodectomy should be avoided as much as possible. First metatars should not be shortened excessively. In osteotomy, dorsal displacement and angulation of distal piece should not be allowed. The patient should be mobilized immediately.

In our study, through soft tissue corrective and bunion resection operation applied under local anesthesia to 86 patients with medium hallux valgus according to Mann Coughlin classification

without admission to hospital, functional loss of our patients were regained, and aesthetical concerns were eliminated. It is important to provide treatment without any need for admission to hospital, risk of anesthesia, and being distanced from social-work life.

We believe that more research is needed including successful results through practical implementations in this field.

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