

# Chinese Consensus on Insertional Achilles Tendinopathy

Chinese Society of Sports Medicine\*†

**Background:** Insertional Achilles tendinopathy (IAT) is a common finding in the clinic. However, consensus on its mechanism, pathological process, diagnosis, treatment, and rehabilitation is lacking. Thus, the Chinese Society of Sports Medicine organized and invited experts representing the fields of ankle disease and tendinopathy to jointly develop an expert consensus on IAT.

**Study Design:** A consensus statement of the Chinese Society of Sports Medicine.

**Methods:** A total of 34 experts in the field of sports medicine and orthopaedics were invited to participate in the compilation of a consensus statement regarding IAT. Consensus was achieved according to the Delphi method. First, 10 working groups composed of 34 experts were established to compile draft statements about clinical problems related to IAT by reviewing and analyzing the available literature. An expert consensus meeting to discuss drafts was then arranged. Each statement was individually presented and discussed, followed by a secret vote. Consensus was reached when more than 50% of the experts voted in its favor. The strength of the proposed recommendation was classified based on the proportion of favorable votes: consensus, 51% to 74%; strong consensus, 75% to 99%; unanimity, 100%.

**Results:** Of the 10 expert consensus statements on the clinical diagnosis and treatment of IAT, there was strong consensus for 8 statements and unanimity for 2 statements.

**Conclusion:** This expert consensus focused on the concepts, causes, pathological process, clinical diagnosis, and treatment of IAT. Accepted recommendations in these areas which will assist clinicians in carrying out standardized management of related diseases.

**Keywords:** Achilles tendon; insertional tendinopathy; diagnosis and treatment; expert consensus

Achilles tendinopathy is one of the most common overuse injuries of the foot and ankle.<sup>29</sup> Common clinical symptoms include pain, swelling, and limited function in the Achilles tendon area. Several professional terms are used to describe this disease, including *Achilles tendinitis*, *Achilles tendon degeneration*, and *peritendinitis*. However, histopathological studies have not revealed inflammatory cells in tissue suffering from Achilles tendinopathy; instead, studies have shown failed repair response to injuries and degenerative changes occurring in Achilles tendon tissue. Therefore, Maffulli et al<sup>19</sup> first referred to these diseases as *tendinopathy* in 1998, a term that was later generally accepted and has been in use

ever since. This condition is now called noninsertional Achilles tendinopathy (NIAT) (occurring within 2-6 cm of the insertion point) or insertional Achilles tendinopathy (IAT) (occurring within 2 cm of the insertion point) based on the injury site.<sup>10,23</sup>

Although Achilles tendinopathy is the generally agreed-upon name of this injury, a unified view of its cause, pathological process, diagnosis, treatment, and rehabilitation is lacking, which has caused confusion in the development of clinical strategies. First-line clinicians often have no reference criteria for the diagnosis and treatment of this injury. For these reasons, the Chinese Society of Sports Medicine organized and invited experts who were authorities in the fields of sports medicine and orthopaedics to jointly develop an expert panel to provide consensus statements on 10 essential problems in the diagnosis and treatment of IAT.

## METHODS

A total of 34 experts with extensive experience in the fields of sports medicine or ankle surgery participated in the compilation of this consensus. Consensus was developed according to the Delphi method. First, 10 groups composed of 34 experts were formed, the literature related to 10 clinical problems associated with IAT was searched and

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summarized, retrieved papers were graded and evaluated, and drafts were prepared. Each of the problems identified is of concern to clinicians and currently has no generally accepted recommendations: (1) definition, cause, and pathological changes of IAT; (2) clinical manifestation, physical examination, diagnosis, and differential diagnosis of IAT; (3) radiologic examination of IAT including radiographs, computed tomography (CT), ultrasonography, and magnetic resonance imaging (MRI); (4) indications for nonoperative and surgical treatment of IAT; (5) rehabilitation treatment (stretching, deep massage, muscle strength training) for IAT; (6) physical therapy (ultrasound, low-energy laser, extracorporeal shock wave, cold compression, acupuncture) for IAT; (7) IAT surgery, including open debridement and repair; (8) IAT surgery using arthroscopic techniques; (9) IAT surgery using open reconstruction; and (10) rehabilitation after IAT surgery.

A representative was appointed for each group, who was responsible for liaising with the consensus writing group, preparing drafts, presenting issues at the later consensus meeting, and answering questions posed by other experts.

At the expert consensus meeting that followed, the 10 problems were individually presented, all questions about the consensus were discussed, and a secret vote was held. Each issue was divided into 2 parts. In the first part, the presenter described the issue. If inconsistent opinions were proposed and supported by 2 additional participants, modification was required and an amendment motion was made. The content of the issue was modified if the proportion of favorable votes was 67% or greater. In the second part, when the participating experts did not propose further modification, another secret vote was conducted. If the proportion of favorable votes was greater than 50%, the consensus was passed and published. If the proportion of favorable votes was 50% or less, the issue was not passed or published in the subsequent expert consensus statement. The strength of the proposed recommendation was classified based on the percentage of favorable votes: consensus, 51% to 74%; strong consensus, 75% to 99%; unanimity, 100%.<sup>32</sup>

The levels of evidence of the references cited for each issue were classified (Table 1),<sup>32</sup> and recommendations were made based on the highest level of evidence.

## RESULTS

All 10 statements passed, meaning that they could be published as an expert consensus.

### Statement 1: Definition, Cause, and Pathological Changes of IAT

**Definition.** IAT is a degenerative and chronic disease that occurs within 2 cm proximal to the insertion and is often caused by overuse. Common symptoms include pain, swelling, and limited function.

**Cause.** IAT is attributable to endogenous and exogenous causes. Among exogenous causes, overuse injuries play a major role in the development of IAT. Endogenous and

TABLE 1  
Classification of Level of Evidence of Similar Studies

A1	Multiple ( $\geq 2$ ) level 1 evidence randomized controlled trials with similar findings or 1 meta-analysis
A2	One level 1 evidence randomized controlled trial
B1	Prospective cohort study
B2	Comparison between groups but not a level 1 randomized controlled trial (eg, case-control study)
C	Case series
D	Case report
E	Expert opinion/basic research

exogenous factors often work together to accelerate disease progression.

**Pathological Changes.** Macroscopic changes in tendinopathic tissue include tendon thickening, uneven surface, hardened texture, decreased elasticity, and degenerative tearing. The microscopic presentation of Achilles tendinopathy includes loss of parallel collagen structure, loss of fiber integrity, fat infiltration, calcification or ossification, and capillary proliferation.

Voting in favor: 100% (unanimity)

Level of evidence: E

### Statement 2: Clinical Manifestation, Physical Examination, Diagnosis, and Differential Diagnosis of IAT

**Clinical Manifestation.** Chief complaints include pain and discomfort at the Achilles tendon insertion that are aggravated by exercise. As the disease progresses, any activity can eventually cause pain.

**Physical Examination.** Swelling and tenderness are present on palpation at the level of the posterior calcaneal tuberosity. Voluntary dorsiflexion of the ankle is limited, and strength of lifting the heel is decreased. The Silfverskiöld test can be positive.

**Differential Diagnosis.** IAT must be distinguished from retrocalcaneal bursitis, Achilles peritendinitis, NIAT, and avulsion fracture of the calcaneus.

Voting in favor: 82.6% (strong consensus)

Level of evidence: E

### Statement 3: Imaging Examination of IAT, Including Radiographs, CT, Ultrasound, and MRI

Radiography, ultrasound, CT, and MRI have important diagnostic value for IAT. Radiographic images can reveal calcification or ossification of the Achilles tendon and abnormalities in the posterosuperior calcaneus, ultrasound can reveal lesions of the Achilles tendon more clearly (highly dependent on the experience of the technician), CT can be used to accurately assess lesion size and location, and MRI can be used to assess the Achilles tendon lesions and surrounding tissues in detail.

Voting in favor: 85.2% (strong consensus)

Level of evidence: B2

#### Statement 4: Indications for Nonoperative and Surgical Treatment of IAT

Nonoperative treatment is the preferred approach for IAT. Operative treatment is indicated in patients who have no symptom relief after 3 to 6 months of nonoperative treatment. If patients with IAT have a visual analog scale for pain score of 4 or higher before treatment, limited ankle joint mobility, history of local corticosteroid injection, and calcification of the Achilles tendon, then the risk of failure of nonoperative treatment is high and surgical treatment can be considered directly. IAT combined with insertional Achilles rupture or Achilles tendon rupture should be treated surgically.

Voting in favor: 80.8% (strong consensus)

Level of evidence: C

#### Statement 5: Rehabilitation Treatment (Stretching, Deep Massage, Muscle Strength Training, etc) for IAT

Rehabilitation treatment (eccentric exercise, massage therapy, stretching, and other rehabilitation training) has some effect on IAT but not to the extent it has on NIAT. Eccentric exercise has some effect on IAT, and in combination with stretching or massage therapy, can improve the treatment efficacy.

Voting in favor: 93.8% (strong consensus)

Level of evidence: B1

#### Statement 6: Physical Therapy (Ultrasound, Low-Energy Laser, Extracorporeal Shock Wave, Cold Compression, Acupuncture, etc) for IAT

Physical therapy can be used as an adjuvant treatment for IAT. Extracorporeal shock wave therapy is widely used and has good clinical outcomes. Other physical therapy methods also have therapeutic effects, but few reports are available, and evidence-based medicine is lacking in this area. Very few randomized controlled trials have been conducted regarding the effectiveness of physical therapy, and it is not yet possible to conclude which physical therapy methods are superior.

Voting in favor: 95.8% (strong consensus)

Level of evidence: B1

#### Statement 7: IAT Surgery: Open Debridement and Repair

Open surgery is commonly used to treat IAT. The surgical approach is selected based on the lesion site, involvement area, and presence or absence of concomitant calcification or ossification. Adequate exposure and thorough debridement are essential for achieving high rates of clinical satisfaction. Thorough debridement of the severely degenerated or calcified tendon might lead to more than 50% deficiency of the entire insertion that needs repair.

Voting in favor: 92.3% (strong consensus)

Level of evidence: C

#### Statement 8: IAT Surgery: Arthroscopic Techniques

Arthroscopic techniques can effectively treat IAT. Arthroscopic techniques can be used to resect Haglund deformity, debride Achilles tendon degenerative tissue, enhance and repair the Achilles tendon, reconstruct the Achilles tendon, and recess the gastrocnemius.

Voting in favor: 95.8% (strong consensus)

Level of evidence: C

#### Statement 9: IAT Surgery: Open Reconstruction

After thorough debridement of IAT lesions, reconstructive surgery should be performed in cases with less than 50% residual tissue. The single- or double-row technique can be used. If the Achilles tendon tissue is too weak and difficult to repair, augmentation techniques such as tendon transposition can be used.

Voting in favor: 95.7% (strong consensus)

Level of evidence: C

#### Statement 10: Rehabilitation After IAT Surgery

In accordance with the principles of individualized rehabilitation, the rehabilitation plan should be based on the degree of the insertional defect of the Achilles tendon, quality of the residual Achilles tendon, and reconstruction method. The main purpose of early rehabilitation is to reduce pain and swelling and prevent complications at the incision site, while the main purpose of later rehabilitation is to restore joint mobility and muscle strength and reduce disuse atrophy.

Voting in favor: 100% (unanimity)

Level of evidence: E

## DISCUSSION

All 10 statements in this expert consensus of the clinical diagnosis and treatment of IAT passed with strong consensus (8 statements) or unanimity (2 statements).

The term *tendinopathy* is based on pathological observation. In earlier literature, this disease was often referred to as *tendinitis* or *peritendinitis* because of swelling, pain, and other symptoms typical of inflammatory reactions at the local lesion site. However, pathological examination does not reveal obvious inflammatory cells or granulomatous tissue (often found during acute injury repair).<sup>18</sup> Instead, the typical changes found on pathological examination mainly concentrate on the following 3 aspects: (1) a disorderly increase in the number of tenocytes, with irregular shapes, significant degeneration, and a tendency toward apoptosis; (2) disordered collagen fibers that are irregularly curled and loosened with smaller diameter and with decreased type I collagen content and partial ruptures visible in the collagen; and (3) increase in content of noncollagenous tissue, such as fibronectin, tenascin C, aggrecan, and biglycan.<sup>18</sup>

Tendinopathy has endogenous and exogenous causes.<sup>20</sup> Essentially, tendinopathy occurs when Achilles tendon healing fails or when healing is slower than the damage to Achilles tendon. In this process, endogenous and exogenous factors combine. Among exogenous factors, overuse injury plays a major role in the occurrence and development of IAT.<sup>20</sup>

The most important clinical manifestations of IAT are pain, swelling, and limited function. Pain can occur intermittently at early stages and is more obvious during exercise. As the injury progresses, eventually any activity can cause pain. Limited function mainly presents as decreased muscle strength and limited joint activity, resulting in decreased exercise capacity.

Nonoperative treatment for IAT is based on focused treatment of pathological changes in tenocytes, collagen, and the extracellular matrix. For example, ultrasound<sup>1</sup> and low-level laser therapy<sup>30,37</sup> can promote tenocyte proliferation and stimulate collagen synthesis. Low-level laser therapy can also inhibit matrix metalloproteinase (MMP) synthesis and reduce extracellular matrix degradation to achieve therapeutic effects.<sup>24,25</sup> Cryotherapy,<sup>15</sup> injection sclerotherapy,<sup>35</sup> and nitroglycerin<sup>27</sup> can reduce capillary permeability and relieve pain. Aprotinin<sup>26</sup> inhibits the production of trypsin, hemolytic enzymes, kallikrein, and MMP; reduces matrix degradation; and improves tendon quality. Platelet-rich plasma (PRP) is rich in growth factors and cytokines and promotes tissue healing.<sup>5,12</sup> However, level 1 evidence randomized controlled trials are needed to confirm the effectiveness of PRP injections for treating IAT.<sup>16</sup> Eccentric traction is a cost-effective and safe treatment that inhibits neovascular regeneration, promotes collagen remodeling, and improves tendon quality.<sup>2,21</sup> Eccentric traction exercise combined with stretching or massage therapy can improve therapeutic effects, but the efficacy of these therapies is lower than that for noninsertional tendinopathy. Shock wave therapy is increasingly used, and its effectiveness has been confirmed in the clinic<sup>4</sup>; its mechanism may be to reduce the destruction of the extracellular matrix and promote healing of the Achilles tendon tissue.<sup>34</sup> High-quality, clinical, level 1 randomized controlled trials to confirm the effectiveness of shock wave therapy are still lacking.

It is currently believed that nonsteroidal anti-inflammatory drugs (NSAIDs) have no therapeutic effects other than analgesia.<sup>16</sup> Studies have even found that NSAIDs may inhibit the migration and proliferation of tenocytes, thereby inhibiting tendon healing.<sup>31</sup> A local injection of corticosteroids can reduce pain and swelling in the short term but ultimately leads to tendon atrophy,<sup>8</sup> rupture,<sup>13</sup> and decreased strength.<sup>7,9</sup> Corticosteroids have been identified as an exogenous cause of IAT.<sup>20</sup>

The purpose of surgical treatment is to completely remove diseased tissue, including degenerative and damaged Achilles tendon tissue, calcified or ossified structures, hyperplastic retrocalcaneal bursa, and protruding Haglund deformity, as well as to stimulate healing of the Achilles tendon tissue through microtrauma. Surgical treatment carries some risk. A large-scale clinical study of 432 patients found an overall complication rate of 11%,

reoperation rate of 3%, wound necrosis rate of 3%, superficial infection rate of 2.5%, and superficial nerve damage rate of 1%.<sup>28</sup> Adequate lesion exposure and complete resection are the basis for achieving a high clinical satisfaction rate. Biomechanical and clinical studies have confirmed that if the residual Achilles tendon tissue after debridement does not exceed 50% of the Achilles tendon tissue, Achilles tendon strength and rerupture rate are unaffected. When the residual Achilles tendon tissue is less than 50% after debridement, then augmentation repair, tendon transposition, or reconstruction must be considered.<sup>3,16</sup> With the gradual development of arthroscopic techniques, applications in the ankle joint have become more widespread. Arthroscopic techniques can be used to effectively resect Haglund deformity, as they involve less surgical trauma, induce faster recovery, and result in fewer complications, thereby improving surgical outcomes.<sup>11,36</sup> Arthroscopic techniques can also be used for the debridement of Achilles tendon degeneration, Achilles tendon augmentation, Achilles tendon reconstruction, and gastrocnemius recession.<sup>6,22,33</sup> Existing studies show that arthroscopic techniques can yield good results in these applications, but because of the small number of studies and the difficulty with the arthroscopic determination of criteria for an Achilles tendon lesion and its management, more high-level evidence-based studies are needed to elucidate the effectiveness of these applications.

Postoperative rehabilitation should emphasize the importance of individualized treatment. Due to differences between individuals, appropriate rehabilitation methods should be selected based on the conditions of the Achilles tendon and its insertion, degree of intraoperative dissection, surgical procedure, and patient response to surgery. Consensus is lacking about the length of postoperative activity restrictions. The advantages of activity at early time points include decreased muscle atrophy, reduced risk of thrombosis, stimulation of fibroblast proliferation, and promotion of collagen remodeling.<sup>14,17</sup> However, premature excessive activity can also lead to adverse effects, such as hematoma formation, poor wound healing, and even avulsion fracture of the calcaneus.

## CONCLUSION

This expert consensus focused on the clinical diagnosis and treatment of IAT, which is beneficial for standardizing the diagnosis and treatment of related diseases.

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