The Current Situation of Anterior Cruciate Ligament in Sports and Effective Treatment Methods in Ho Chi Minh City (Vietnam)

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ABSTRACT

Athletes’s anterior cruciate ligament (ACL) injury in Vietnam is very common and tends to increase rapidly in the number of cases as well as the cost of treatment. Therefore, it is necessary to study effective treatments for these types of trauma. This article shows that patients who have had ACL reconstruction surgery in Ho Chi Minh City (Vietnam) had a quite large success rate of 75-95% and their recovery results were very good after ligament reconstruction surgery.

Keywords: ligaments, treatment, recovery, regeneration, injury, sports.

I. INTRODUCTION

Sports injuries are injuries occurring while participating in sports activities that limit or suspend the athlete's ability to participate in these activities. These injuries affect an athlete's ability to concentrate on training and performance. If these athletes play professionally, the injury can affect the performance of the club or team [4]. In the most common sports injuries of the lower extremities, ACL injury is very common. It accounts for nearly 40% of all sports injuries to the lower extremities.[2], [3] However, initial diagnosis, treatment and follow-up are not really good despite many efforts of Viet Nam medical and sports industries over the past 20 years.

The causes of ACL injuries are diverse, which can be from sports injury, traffic accident or life accident. In the United States, about 200,000 people suffer from ACL every year, and more than half of them require surgical treatment [1], [5]. A national study showed that within 15 years, from 2000 to 2015, nearly 200,000 cases had ACL reconstructive surgery in Australia [16]. These data do not take into account the cases of biological cell treatment. Obviously, ACL injury is a problem for many countries around the world, although many of them have modern medical treatment and very good injury prevention. It is worth noting that the medical costs for treating and caring for ACL lesions are enormous, about $ 1 billion a year in the US. These costs are continuing to increase due to the frequency of injuries as well as the need for treatment.

There are two main mechanisms of ACL damage: direct and indirect. Direct injury occurs when there is a direct collision on the front outside of the pillow in the situation of tackling the ball or in a traffic accident. However, this injury mechanism accounts for only about 30% of the total. Indirect injuries tend to account for a higher proportion, up to 70%. Possible causes include running, sudden stops and rapid redirection; Turn to the opposite side while the foot remains; High jump, falling one leg to the ground in an unfavorable position [1].

Approximately 50% of ACL lesions are accompanied by other lesions such as cartilage rupture, meniscus tear, posterior cruciate ligament damage and bone marrow edema ...

ACL injuries are especially common in high impact competitions or in need of good landing movements such as soccer, volleyball, or tennis. In particular, soccer is the sport that often causes ACL injuries the most [15], [1].

Signs of ACL injury include: Muscle signs; Entity signs.
- The common signs of muscle function are swelling and pain in the knee, loose knee, muscle atrophy.

- Physical signs: Tests performed by specialists help diagnose ACL lesions such as: front drawer sign (sensitivity 62%), Lachman sign (sensitivity 84%), signs Pivot shift (62% sensitivity). Doctors can perform additional solutions such as Mc Murray, Thessaly, Appley, block and pull back ... to assess accompanying injuries [7]. In addition, Magnetic resonance imaging (MRI) also has very high diagnostic value with approximately 86% sensitivity and 95% specificity [7].

Natural progression after damage to ACL (if no surgery) depends on the level of injury, age, level of activity of the patient. There are usually two levels of the lesion as follows:

- Partial rupture of ACL (stretching, incomplete rupture): the patient is mostly good if he can practice rehabilitation properly, with enough time, usually at least 3 months. However, there are many patients, although the damage is not complete, the pillow is still unstable. At this point, biological methods of treatment should be in place [1].

- ACL complete rupture: Most patients have poor prognosis without surgery. Patients with severe knee looseness, unable to walk normally, loss of ability to play sports. Not to mention the concurrent damage will make the loss of function happen faster. The consequence of prolonged loosening process is the appearance of secondary lesions such as meniscus tearing (> 90%), joint cartilage (70%), and finally knee degeneration (60% after 10 years) [14].

II. MATERIALS AND METHODS

This research has been collected from the practice of examination and treatment of orthopedic trauma in Ho Chi Minh City (Vietnam). At the same time, there are references to sources of books, magazines, medical articles, especially ACL surgical and reconstructive therapies. The results obtained through analysis and synthesis of data of patients, especially athletes with knee injury, are treated for ligament reconstruction and are effectively recovered.

III. RESULT

A. Current situation of ACL injuries in sports activities in Ho Chi Minh City (Vietnam)

There are currently no studies on the frequency, impact and effectiveness of ACL trauma treatment nationwide of Vietnam. However, according to estimates, each year there are about 8,000 reconstructive ACL surgeries, mainly concentrated in the two largest cities in the country, Hanoi and Ho Chi Minh City. But a large number of annual pre-cross ligament injuries in Vietnam are underdiagnosed and promptly treated due to socio-economic problems as well as amateur athletes's limited understanding of physical trauma.

According to a 2006 conference report by Phan Vuong Huy Dong et al., ACL injury was most common among amateur athletes (about 60%), followed by professional athletes (about 30%). Among them, football caused the most ACL injuries (about 60%). The injury rate of men is higher than that of women. The patients in the study group only 25% of cases were ACL alone and 75% had associated lesions (the most common is meniscus) [2]. This statistic shows that the ACL pattern in Vietnam is relatively similar to that of developed countries [7].

B. Treatment methods for ACL injuries in sports activities in Ho Chi Minh City (Vietnam)

1. Non-surgical treatment

Conservative and rehabilitation treatments play an important role. However, when ACL lesions are moderate but other lesions accompany, surgery should be done. Non-surgical indications for anterior ACL lesion include incomplete rupture of ACLs: the knee joint remains firm; Complete removal of ACLs in patients who have no symptoms or a need to play sports or will either give up sports, or are less active (due to age) or need delay (in children with developing cartilage).

2. Less invasive biological treatment

If the damage to the ligament is only moderate, then platelet-rich plasma (PRP-Platelet-Rich Plasma) or adipose-derived stem cells (ADSCs - Adipose tissue-derived stem cells) are the best choices to help aids in the healing process of ligaments [10].

PRP is a product obtained from the blood of the patient (autologous) with high platelet content and biological molecular factors are many times higher than normal levels. PRP is injected directly into the damaged ligament tissue, helping to speed up the recovery process without having to replace the original ligament.

Similarly, ADSCs extracted from patient's adipose tissue, which have relatively good differentiation functions, are a potential therapy.

Stem cells in another form are continuing to be studied, opening an era of less invasive treatment for people with ACL damage.

3. Treatment with ACL reconstructive surgery

ACL suture surgery has long been ineffective, so reconstructing it with another piece of tendon replaced through an endoscope is the most common surgical method today.
C. Alternative tendons (pieces used for grafting)
- Patient's own Patella tendon.
- Patient's own Hamstring tendon (tapered tendon and semipendicular muscle).
- Patient's own Thequadriceps tendon.
- Long flap.
- Tendon of the same type (taken from donor): A-sinus tendon, patella tendon, posterior ligament, long lateral ligament.

D. Advantages and disadvantages of alternative tendons
- Patient's own Patella tendon:
  Advantages: bone-healing mechanism should heal faster and stronger tendon fragments than other types of graft.
  Disadvantages: Pre-knee pain often occurs, weakens the stretching system, other complications such as tendon rupture or sub-kneecap rupture may occur, knee stiffness and limited stretching range.
- Patient's own Hamstring tendon (tapered tendon and semipendicular muscle):
  Advantages: It avoids the limitations of Patella tendon. At the same time, the incision is small, quickly recovered.
  Disadvantages: compared with Patella tendon, the inter-tendon time is often later, easy to stretch if not carefully recovered.
- Patient's own Thequadriceps tendon:
  The quadriceps tendons can be used to reconstruct ACLs in patients after failed Hamstring surgery. The downside to taking tendons of quadriceps is pain and bad scarring after surgery.
  - Long flap: the advantage is easy to take tendons, small incisions. However, the weakness is that after the tendon is removed, the foot becomes unstable outward, easily leading to ankle injuries.
  - Tendon of the same type (taken from donor): Currently less common in Vietnam, mainly in developed countries and tissue banking systems.

There are different surgical techniques: one tunnel bundle, one tunnel bundle, two bundles of three tunnels, two bundles of four tunnels, etc. Each technique has its own advantages and disadvantages, the choice of which technique depends on the views and experiences of each surgeon, the needs and suitability of each patient. Surgeons need to pay attention to the following characteristics to choose suitable surgical techniques, that is, Vietnamese's size of knee are relatively small compared to developed countries's. At the same time, it is necessary to plan for cases that will have to be re-operated (Revision).

E. Practical treatment of ACL injuries in sports in Ho Chi Minh City (Vietnam)

The clinical statistics show that the number of ACL lesions in Ho Chi Minh City ranged from 3,000 to 4,000 cases. This number is continuing to increase with the need for treatment of patients as well as the frequency of injuries steadily increasing over the years. An Australian report also shows that the number of ACL reconstructive surgeries is increasing rapidly, from 2.49 (2000-2001) to 5.65 cases per 100,000 population (2014-2015) and the rate of treatment failure requiring re-treatment. also increased (from 4.4% to 6.8% of total cases) [16].

Patients who have recurrent ACL surgery have a success rate of 75-95% [2]. A retrospective study of 107 patients in 2008 by Phan Vuong Huy Dong et al recorded a very high surgical success rate with 94% of patients with a well-rated Lysholm score 6-12 months after surgery. In addition, the project evaluating the results of laparoscopic ACL laparoscopic surgery with hamstring tendons using a bio-fixing screw at Viet Duc Hospital (Nguyen Thanh Van, 2010-2011) also showed very good recovery results after surgery [5].

The period after surgery is very important to help the athlete get back to his favourite sport. Below is a classic rehabilitation exercise that is accepted by the vast majority of clinicians after reconstructive ACL surgery.

Week 1-2: Light exercise, protect the graft, prevent swelling and stiffness.
Week 2-4: Recovery of gait, range of motion, and muscle atrophy.
Week 4-10: Strong muscle training, functional movement, avoid overload.
Week 10-16: Return to normal activities.
Week 16 +: Return to increasing sports activities. Heavy practice after 7 months.

IV. DISCUSSION

As discussed above, the treatments for ACL lesions are diverse. However, the most important factor in choosing the optimal treatment is ACL injuries that need to be diagnosed early, determine the best treatment method and monitor and rehabilitate well. At the same time, patients should be consulted to limit re-injury.

The purpose of surgery is to loosen the knee joint, restore the function of ACL, thereby strengthen the knee, helping the patient return to normal activities and sports. However, there are a number of factors that make patients and doctors need to consider, decide on surgery or conservation:

Factors for the patient to consider: Adults with a lot of activity, athletes or manual workers should have surgery. As for those who are old, but the need for activities is still much, it should be considered when deciding on surgery. Children who...
are growing, should consider surgery because it can damage the
development of cartilage. In these cases, surgeons should delay
surgery until there are technical improvements or wait until a
time when the risk of damaging a child’s developmental
cartilage is lower.

Consideration factors for the physician: Moderate or lower
lesions should be treated with a non-surgical or less invasive
biological approach. This both helps to reduce complications
during and after surgery while still helping the patient achieve
the goal of treatment.

Besides, it is worth mentioning that at present, less invasive
biological cell treatments are still being used. It is only about
200 of these cases and only 3 centers in the South are
implementing the model, this treatment. They are Ho Chi Minh
City Sports Medicine Association, Van Hanh Hospital and
Khanh Hoa Provincial General Hospital. Vinmec General
Hospital has also recently been involved in the treatment of
ligamentous injuries with the biological cell method. Other
centers or hospitals have only limited implementation or cannot
deploy.

V. LIMITATIONS

The limitation of this study is that it has not clearly classified
for subjects with ACL damage between professional sports
players, amateurs and normal people. However, those
limitations could be mitigated by further research in the near
future.

VI. CONCLUSION

The development of biotechnology is opening a new era for
less invasive treatment for patients worldwide. But the ability
to respond and disseminate effective treatment techniques for
ACL lesions in Vietnam is still limited. Through a survey of the
practice of special-use treatment for ACL injuries in sports in
Ho Chi Minh City, it is found that the treatment needs of
patients as well as the frequency of ACL injuries are steadily
increasing over the years. However, an encouraging thing is that
the number of patients who have had a high success rate of 75–
95% for ACL reconstruction surgery. In addition, if the patients
follow the procedure after 16 weeks of effective recovery
training, they will be able to return to their favorite sport.

In order to perform well the examination and treatment of
ACL injuries in athletes, it is essential to have close cooperation
between sports-related organizations such as sports medicine
centers, federations, sports clubs, professional and amateur
sports associations.

REFERENCES

[1] Phan Vuong Huy Dong (2012), the lecture of “Anterior Cruciate Ligament
injury in sports”.
[2] Phan Vuong Huy Dong (2012), “Results of treatment of reconstructive
Anterior Cruciate Ligament with patella tendon in 600 cases from
December 1999 to May 2005”. Injury and Orthopedic Hospital
Conference Report, HCMC.

[3] Nguyen Van Quang et al (2002), “An outline lecture on sports injuries”,
Medical Publishing House.
[4] Nguyen Lan, “Rehabilitation of patients after anterior cruciate ligament
reconstruction”, (https://www.academia.edu/31695362/PHU_C_HOI_CHU_C_NANG_CH_O_BENH_NHAN_SAＵ_PHAU_THUAT_TAI_TAO_DAY_CHANG_CHEO).
[5] Nguyen Thanh Van (2012), “Evaluation of the results of laparoscopic
ACL surgery with hamstring tendons using a bio-fixing screw at Viet Duc
Hospital in 2010-2011”, Master's thesis in Medicine, Ha Noi, Vietnam.
[6] Allan M. Joseph, Christy L. Collins, MA, Natalie M. Henke, BS, Ellen E.
Yard, PhD, Sarah K. Fields, JD, PhD and R. Dawn Comstock, PhD (2013),
“A Multisport Epidemiologic Comparison of Anterior Cruciate Ligament
Injuries in High School Athletics”, from Journal of Athletic Training are
provided here courtesy of National Athletic Trainers Association
(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3867093/).
[7] Cimino, Francesca, Bradford Scott Volk, and Don Setter (2010),
“Anterior cruciate ligament injury: diagnosis, management, and
prevention”, Am Fam Physician 82.8 (2010): 917-922.
[8] Erin Coleman, R.D., L.D. (2018), “Statistics on ACL Injuries in Athletes,
trich xuật từ trang sportsrc, ngày 5/12/2018.
(https://www.livestrong.com/article/548782-statistics-on-ACL-injuries-in-
athletes/).
[9] Fleming BC, Holstyn MJ, Oksendahl HL, Fadale PD (2005), “Ligament
injury, reconstruction and osteoarthritis. Curr Opin Orthop. 2005;16(5):354–362.
[10] Frese, Laura, Petra E. Dijkman, and Simon P. Hoerstrup (2016), “Adipose
tissue-derived stem cells in regenerative medicine”, Transfusion Medicine and
Hemotherapy 43.4 (2016): 268-274.
[11] Gianotti SM, Marshall SW, Hume PA, Bunt L (2020), “Incidence of
anterior cruciate ligament injury and other knee ligament injuries: a
national population-based study”. J Sci Med Sport. 2009;12(6):622–627.
[12] Hewett, T. E., Myer, G. D., Ford, K. R., Heidt, R. S., Jr., Colosimo, A. J.,
McLean, S. G., Succop, P. (2005), “Biomechanical measures of
neuromuscular control and valgus loading of the knee predict anterior
cruciate ligament injury risk in female athletes: a prospective study”, Am
J Sports Med, 33(4), 492-501.
[13] Joseph, Allan M., et al. (2013). “A multisport epidemiologic comparison
of anterior cruciate ligament injuries in high school athletes”, Journal of
Athletic Training 48.6 (2013): 810-817.
[14] Lohmander LS, Englund PM, Dahl LL, Roos EM (2007), “The long-term
consequence of anterior cruciate ligament and meniscus injuries:
osteoarthritis”, Am J Sports Med. 2007;35(10):1756-1769.
[15] Mihata LCS, Beutler AI, Boden BP (2006), “Comparing the incidence of
anterior cruciate ligament injury in collegiate lacrosse, soccer, and
basketball players: implications for anterior cruciate ligament mechanism
and prevention”, Am J Sports Med. 2006;34:899-904.
[16] Zbrojkiewicz, David, Christopher Vertullo, and Jane E. Grayson (2018),
“Increasing rates of anterior cruciate ligament reconstruction in young
Australians, 2000-2015.” Medical Journal of Australia 208.8 (2018): 354-358.
[17] Frese, Laura, Petra E. Dijkman, and Simon P. Hoerstrup (2016), “Adipose
tissue-derived stem cells in regenerative medicine”, Transfusion Medicine and
Hemotherapy 43.4 (2016): 268-274.
[18] Mahapatra, Piyush, Saman Horriot, and Bobby S. Anand (2018),
“Anterior cruciate ligament repair–past, present and future”, Journal of
experimental orthopaedics 5.1 (2018): 20.
[19] Wikipedia, the free encyclopedia (2020), “Sports injury”.
(https://en.wikipedia.org/wiki/Sports_injury).
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