

Early Mobilization for Acute and Chronic Injuries. Proceedings 7<sup>th</sup> Annual Promoting Excellence Symposium in the Southeast, Amelia Island, Sept 29-Oct 2, 2011.

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## Introduction

Early mobilization performed within 1-3 days after most injuries or surgeries is currently accepted as a preferable treatment to promote quality healing for human patients.<sup>1-5</sup> In addition, immobilization has been shown to be detrimental to promote quality healing in the horse.<sup>6-9</sup> Studies evaluating equine rehabilitation protocols have shown that an organized rehabilitation program produced a higher return-to-work level than turn out.<sup>10-12</sup> Improvement in tissue alignment, limitation of connective tissue fibrosis, preservation of range of motion and neuromuscular activation have all been shown to aid in producing a quicker recovery and a return to full activity.<sup>13-16</sup> The fear that early mobilization may lead to higher reinjury rates has not been substantiated.<sup>17,18</sup> While equine structures probably heal more slowly than human structures, and the body mechanics are different, the healing process is markedly similar.

## Discussion

Due to the brevity of this article, anterior cruciate ligament (ACL) rehabilitation will be used to illustrate the concept of early mobilization. While there are distinctions between the rehabilitation procedures for different injuries and the degree of these injuries, the general concepts are similar.

Rehabilitation protocols used today have changed dramatically overtime. To illustrate this, the history of the development of ACL rehabilitation from 1960 to present will be presented.<sup>19</sup> In ACL studies performed during the 1960's, research showed that the majority of healing after injury or surgery occurred in the first 3-4 weeks. The clients would be casted for short periods of time (1-2 weeks) after surgery and then told non-specifically to resume "normal activity" by the end of 8-10 weeks. In the 1970's *in vitro* studies seemed to show that healing needed a longer period for full maturation. Therefore casts were used for prolonged periods of up to 12 weeks, with no weight bear for 14 weeks. By the mid 1970's, problems were being observed in clinical practice with this long immobilization time due to muscle atrophy and reduced bone strength, and casting was reduced to 6 weeks. In the 1980's studies showed improved healing and recovery utilizing no casting, early weight bear and early continuous passive motion devices immediately after surgery. During the 1990's the addition of increased range of motion exercises to improve flexibility, gait mechanics exercises and trunk stabilization exercises continued to further improve the outcome of patients with ACL. Presently, these exercises are being further modified to obtain better and faster rehabilitation outcomes.

However, this is not to say that there are not benefits to immobilization. Some inflammation is not bad and we know that phagocytosis is necessary for healing to begin. In addition, severe wounds, fractures and ruptures require a period of immobilization to obtain the mechanical strength necessary for healing.<sup>20,21</sup> Overloading in the early stages of healing can lead to increased connective tissue formation and is detrimental to collagen orientation especially during the first 3 weeks.<sup>22-24</sup>

A 2010 study reviewed the long-term results of over 1000 patients utilizing early mobilization after ACL surgery. The authors concluded that an evidence-based rehabilitation protocol should include an accelerated program emphasizing early mobilization.<sup>25</sup> When accelerated rehabilitation protocols were evaluated, the patients returned to sport-specific activities at 6.2 weeks and to athletic competition at full capacity at 6.2 months, half the time of traditional rehabilitation protocols. Longitudinal follow up for an average of 4.4 years showed that the patients retained full range of motion, stability, strength and a return to full function in 85% of cases.<sup>26</sup> In a study of 64 achilles tendon ruptures where early mobilization was used, no reruptures occurred.<sup>27</sup>

How to best obtain early and active rehabilitation in the human population has been refined as different modalities and techniques are developed. While early mobilization protocols cannot be directly transferred to equine use, the implications are intriguing and worthy of consideration. The utilization of functional electrical stimulation (FES), dry and water treadmills, swimming and hyperbaric chambers in veterinary practice have expanded the options for early mobilization.

Functional electrical stimulation (FES) can be used during rehabilitation to obtain controlled-early-passive motion, especially during periods where the horse should not be allowed repetitive ground reaction stress to the injury.<sup>28,29</sup> A 2011 study of 96 ACL surgery patients, compared rehabilitation with and without neuromuscular electrical stimulation. The electrical stimulation group showed an improvement in isokinetic strength of the knee extensors and proprioception by 50%, while the control group showed a 26% improvement.<sup>30</sup>

A working protocol for early mobilization of muscle, tendon and ligament strains (Grade 1), sprains (Grade 2) and tears (Grade 3) is listed in Table 1. The protocol makes a distinction between the times for increased stress and increased repetitions, due to the different tissue responses to each.<sup>31-33</sup>

Initially, FES intensity can be used to provide the tension and stress required for early mobilization, while keeping ground reaction forces low. Then ground reaction forces can be gradually increased with exercise, waiting until the injury can sustain increased stress before increasing repetitions. Serial ultrasounds will aid in determining the progress of the protocol, and if healing is not progressing as desired, then the protocol can be altered.

	Onset of injury	Day 3	Week 1	Week 2	Week 3 (Type I collagen turnover)
Grade 1 (strain)	Ice/Compression FES 10% flexion	Ice/Compression FES 25% flexion Hand walking 15-20 min	Ice/Compression FES 50% flexion Hand walking 20-30 min Trotting 5 min cont	FES 100% flexion Hand walking 30-45 min Trotting 5 min cont x 2 Cantering 5 min cont	FES 100% flexion Trotting 10 min cont x2 Cantering 5 min cont x 3
Grade 2 (sprain)	Ice/Compression FES <10% flexion	Ice/Compression FES 10% flexion Hand walking 10-20 min	Ice/Compression FES 25% flexion Hand walking 15-30 min	Ice/Compression FES 50% flexion Hand walking 20-30 min Trotting 5 min cont	FES 100% flexion Hand walking 30-45 min Trotting 5 min cont x 2 Cantering 5 min cont
Grade 3 (tear)	Rest/Ice/Compression	Ice/Compression FES <10% flexion	Ice/Compression FES 10% flexion Hand walking 10-20 min	Ice/Compression FES 25% flexion Hand walking 15-30 min	Ice/Compression FES 50% flexion Hand walking 20-30 min Trotting 5 min cont

TABLE 1. Early mobilization techniques for muscle, tendon and ligament, utilizing diagnostic evaluations to determine progression.

### Summary

Tissue integrity is the number one focus of a quality rehabilitation program, with speed of the rehabilitation process being second. As research continues to refine rehabilitation protocols, these two goals may prove to be more cooperative than competitive. Early mobilization is improving outcomes and reducing reinjury in human athletes and is an intriguing tool in equine rehabilitation. The distinctions between grades of injury and the appropriate time to increase stress and repetitions can prove be useful tools in equine rehabilitation.

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