Interski 20th Congress - Ushuaia 2015

Spanish Ski School

Association of Schools, Professors and Trainers

of Winter Sports

Evolution of carving revolution:

A turning point to knee injuries prevention?

Revolution: Sudden or violent change

Evolution: Gradual development

The Spanish Ski School have felt long time concerned on the biomechanical implication of skiing on the joints and how teaching would be thought to follow the normal physiology as close as possible.

Knee ligament injuries are the most frequent ski-related lesions - sometimes severe- having potential major consequences as instability or arthritis which may lead to leave skiing practice.

The first time we pose arguments about the influence of carving technique on the possibilities of having a ligament injury of the knee was in 1999, during the 16th Interski Congress, in Beitostolen. The title of our speech was "**Carving technique: Biomechanical implications"** and was developed from some reports in papers published in scientific journals about the growing incidence of cruciate ligaments skiing injuries after the Carving technique revolution. Carving technique was a sudden, abrupt change from the classical technique of alpine ski, and this revolution would be possible too much "fast" and we were not still ready being obliged to adapt the way of skiing to a new way of doing. As a result, physicians dedicated to ski lesions and knee surgery noted an increment of the prevalence of cruciate ligaments injuries. Then we detected that one of the technical changes consisted of a varus position (like the typical cow-boy knee) of the inner knee during the turn... what was not a natural position and represents (from a mechanical point of view) a risk for the knee. This was the take-home message and the proposal of our lecture.

The professionals of our Ski School started to work then on the way of avoiding varus position working to look for a more natural an safe way of skiing.

Later on, at the time of the the 17th Interski Congress, in Crans-Montana. we were insisting on the same idea and give a presentation entitled **"The safest position for the knee while skiing"** and we had

already introduced some changes in teaching to ski by substituting varus of the inner knee by inclination of the body and an attempt to lead the knee to a valgus position, which is safer and more physiological.

Since then, we have been working to come back to the safest possible position in order to teach how to protect the knee better and, if possible, to avoid lesions. So, our following presentations in Korea and in Austria explain again our efforts in this line.

My task is to think of how anatomy and biomechanics may be altered by stress-strain forces which vary from one specific sport to other, from one person to other people and, with the anatomical characteristics and normal variations... as the shape of the knee, leg, and ankle, for example, which may interact with the boots and the individual technique.

Your task consists of applying your knowledge and ability to use the technique to make the final evolution necessary to achieve the aim of enjoying the ski and teaching the safest way of doing.

Once we are able to detect defects in a specific technique -if any- we have to lead the necessary evolution which (in the case of carving technique) started by thinking a varus position of the inner knee to better adapt the body to the ground on the skis and to apply forces to the ground properly with both skis.

We will remind some anatomical aspects and how the evolution of the carving technique has lead progressively to look for a position in which the inner knee goes more and more in flexion and in valgus position trying to get closer of the that steers the turn.

There are concepts that remain stable whatever our evolution may lead us to apply different teaching procedures:

A forwarded (advanced) position may difficult to control or steer the turn, unless we are skiing downhill fast or very fast. Skiing in a backward displaced position does not enable the skier to steer the turn correctly and effectively and is therefore dangerous. We have to avoid it.

Lateral inclination or tilting goes parallel to speed. To achieve an efficient lateral inclination the knees has to be in valgus position and different degree of flexion. The varus position is always risky -especially when it goes together with internal rotation of the knee- and has to be avoided.

Both extension and flexion turns have an intermediate phase in which muscle protective action decreases; we may call it the “floating knee” phase. This phase -in which there may be unaware movements- is shorter in a neutral turn. From a safety point of view, a neutral turn is safer and more economical in terms of effort. So, a neutral turn would be -in our opinion- the first choice in ski instruction, together with the snow-plow turn which is still the golden rule for the very beginners.

All these theoretical considerations are always geared towards standard alpine skiing and to enable skiers to adapt themselves to the terrain in order to absorb vibrations and dealing with unexpected surprises. This is best achieved with the knee that steers the turn, in the valgus position, internal rotation, quadriceps protective action and the help of the hip joint. Adduction and internal rotation of the hip keep the whole lower extremity tightened against the terrain and the knee protected. The inner knee should try to imitate the position of the steering one... but looking for its one place... how to do it is your task.

Finally, we still summarise all the ideas we have dealt with, with a proposal to make. To ensure safety, think about the "strong position of the knee" and, when teaching, promote the following:

- Semi-flexion, even mantained
- Body axis just on the feet
- Not too much lateral inclination while turning
- Avoid the varus position of the knee, it is a weak and dangerous one