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Low level laser treatment of chondromalacia patellae

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Summary. *A randomized, double blind study of low level laser treatment of chondromalacia of the patella in 40 patients has been undertaken. Chondromalacia was established by arthroscopy and was related to subjective symptoms. Eight treatments were given during five weeks by a physiotherapist with the use of a GAAS pulsed laser, real or sham. Assessment of the location, quality and intensity of pain, and the influence on mood, gait, sleep, work, and sports was made before and after treatment including an eight to twelve week evaluation. No statistical difference was found between real and sham use of low level laser for the symptoms of chondromalacia of the patella.*

Résumé. *On a réalisé chez 10 malades une étude randomisée, à double insu, du traitement de la chondropathie de la rotule par laser de basse intensité. Le diagnostic avait été confirmé par arthroscopie, en présence d'une symptomatologie subjective. Huit séances de traitement ont été effectuées pendant cinq semaines par un physiothérapeute utilisant un laser alternatif GAAS, réel ou simulé. Une évaluation du siège, du type et de l'intensité de la douleur ainsi que de l'influence de l'humeur, de la marche, du sommeil, du travail et de l'activité sportive a été faite avant et après traitement. Aucune différence statistiquement valable n'a pu être mise en évidence entre l'effet d'un laser réel ou simulé vis à vis des symptômes de la chondropathie rotulienne.*

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Introduction

Patello-femoral joint pain aggravated by activity may be due to chondromalacia of the patella. This diagnosis is often made by the observation of changes in articular cartilage at arthrotomy or arthroscopy [2, 4, 12].

The usual appearance of the cartilage is a softening and fibrillation of the central ridge or the medial facet of the patella [14]. Microscopy shows superficial swelling with collagen fibre breakdown and repair [13]. It is thought that pain over the front of the knee is due to the involvement of the subchondral bone which may show an increased uptake on technecium bone scan [2, 5, 6].

Chondromalacia of the patella is usually treated by local rest, knee support, analgesics, and quadriceps exercises. Surgical treatment is often unsatisfactory and low level laser treatment has been assessed for its relief of the symptoms of anterior knee pain.

A laser beam may have high or low level intensity for its use on human tissue. Low level, non-coagulative laser treatment has been shown to increase cell mitosis of epithelial cells, to change the distribution density of capillaries and granulation tissue and to increase collagen synthesis of fibroblasts with hypertrophy and hyperplasia of rough endoplasmic reticulum and the Golgi complex [1, 3]. It has been shown to stimulate bone healing in fractures of rats [9]. Other investigation has indicated reduction of chronic pain by an increase of electrical activity in peripheral nerves, an increase of serotonin metabolism and a decrease in the amplitude of electrical evoked potentials [16, 17].

Patients and method

Forty patients with chondromalacia of the patella, who had no other kind of treatment, were selected for a random, double blind study of the use of low level laser treatment or a sham of the treatment.

The diagnosis of chondromalacia was made by arthroscopy after normal radiographs. Patients with other disease or surgery of the knee were excluded.

The laser was a pulsed GaAs type with a wave length of 904 nm and a measured output of 17 mW at a 1000 Hz frequency, manufactured by Irradia, Sweden. Treatments were given 8 times in a 5 week period by physiotherapists. The laser apparatus had a double switch which allowed real or sham emission of light in relation to the direction given in a drawn envelope. The probe was directed at a right angle over the skin of the patella for ten minutes, the ipsilateral femoral nerve in the groin, and the proximal part of the peroneal muscles for one minute, as described by J. Walker [11].

Before and after treatment the patients were interviewed and examined by the same orthopaedic surgeon. Pain was described by location, quality, and intensity with the use of patient choice of adjectives. A 100 mm. visual analog scale (VAS) was used to determine intensity of pain and a body chart to determine pain location. Disability was estimated by the influence of pain on mood, gait, sleep, work, and sport. An eight to twelve week follow up was determined by telephone interview.

The physiotherapist and the orthopaedic surgeon were unaware as to the use of real or sham laser. A local ethics committee approved the study.

Results

The Mann-Whitney U test, the Wilcoxon matched pairs signed ranks test, and the Fishers exact probability test of effect of treatment were used in the evaluation of results.

Four of the forty patients withdrew from the study and the remaining 36, 19 with low level laser and 17 with sham laser, were compared as to age, sex, disease duration, visual analog scale for pain intensity and disability score for activities. No statistical difference was found between the groups by the Mann-Whitney U test (Table 1).

After treatment, ten of 19 patients with real treatment and five of 17 with sham treatment were improved and improvement was maintained in all but two of the sham group. The difference was not statistically significant on the chosen level of significance (Table 2).

The age of patients with improvement or a positive outcome was significantly older but there was no correlation of outcome with disability score, pain intensity or duration of disease, by Mann-Whitney U test (Table 3).

Discussion

Analysis of forty patients with chondromalacia of the patella confirmed at arthroscopy, indicated that this is not a self-limited disease of female teenagers. It is a disease of median age, slightly over 30, equal sex incidence and with a median duration of more than four years (Table 1).

However, there is a bias in this study to the most severely affected population who did not benefit from conservative measures. Patients with patellofemoral pain are not arthroscoped as a routine.

More serious intra-articular disease was excluded and no other surgical measures were used.

Table 1. The patients

	N	Age	Sex	Dur. (year)	VAS (mm)	Disabil.sc.
LLLT	19	35 (17–56)	11 F 8 M	4 (1–10)	60 (1–10)	9 (5–12)
Control	17	31 (17–56)	9 F 8 M	6 (1–22)	70 (2–10)	7 (3–19)

LLLT = Low level laser treatment, N = number of patients, Dur. = duration of disease in years, VAS = visual analog scale, Disabil.sc. = disability score in arbitrary units. All values in means.
There were no statistical difference between the groups (Mann-Whitney U test: $p > 0.05$).

Table 2. Results

	VAS (mm)	Disabil.sc.	Effect (n)	No effect (n)
LLLT	4 (0–8)	6 (0–14)	10	9
Control	5 (1–7)	5 (0–14)	3	14

VAS = visual analog scale, Disabil.sc. = disability score, Effect = number of patients with effect of treatment, LLLT = low level laser treatment
The fall in VAS and disability score after LLLT was not significant on the chosen level of significance (Wilcoxon matched pairs signed ranks-test: $P > 0.05$. Fishers exact probability test of effect of treatment: p 0.064)

Table 3. LLLT and patients with positive treatment outcome compared with subjects with negative outcome.

	Positive outcome	Negative outcome
Age	40.5 (19–48)	24 (18–36)
Disabil.sc.	7.5 (1–13)	9 (1–17)
VAS	4.5 (10–90)	6 (10–75)
Dur.	3.5 (1–10)	4.0 (1–10)

VAS = visual analog scale, Disabil.sc. = disability score, Dur. = duration of disease in years.
The patients with positive effect of LLLT was significant older than the patients with no effect (Mann-Whitney p = 0.035).
There was no correlation between positive outcome and pain, duration of disease or disability (Mann-Whitney $p > 0.05$)

It is postulated that low level laser treatment has analgesic properties and a "biostimulatory effect on connective tissue" [10, 17].

The benefit noted by real laser treatment is better maintained for eight to twelve weeks than with sham laser treatment. It may be that this is due to the stimulation of fibroblasts and microvascular proliferation rather than just an analgesic effect.

There is a poor correlation between patellofemoral pain and cartilage lesions although the main symptom of chondromalacia of the patella is patellofemoral pain [5, 8, 11].

An unexpected finding was the presence of a vastus medialis muscle trigger point on examination of the majority of the studied patients. This may refer pain to the patellar area [15] and explain the poor correlation between symptoms and patellar changes [16, 17].

Although this study has not established a significant benefit from low level laser treatment compared to sham laser treatment of chondromalacia of the patella, further investigation on its use is warranted.

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