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Trötthet och återhämtning i ländryggen – Utvärdering av muskelfunktion hos patienter med långvarig ländryggsmärta och ryggfriska personer

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Personer med långvariga, återkommande smärtor i ländryggen (svanken) kan ofta uppleva trötthet i ryggen. Studier har visat att dessa personer ofta har lägre styrka och sämre uthållighet i sina ryggmuskler än personer utan smärttillstånd i ryggen, så kallade ryggfriska personer. Huvudsyftet med denna avhandling var att utvärdera en mätmetod, vilken på ett objektivt sätt antas mäta muskeltrötthet. Mätmetoden heter elektromyografi (EMG).

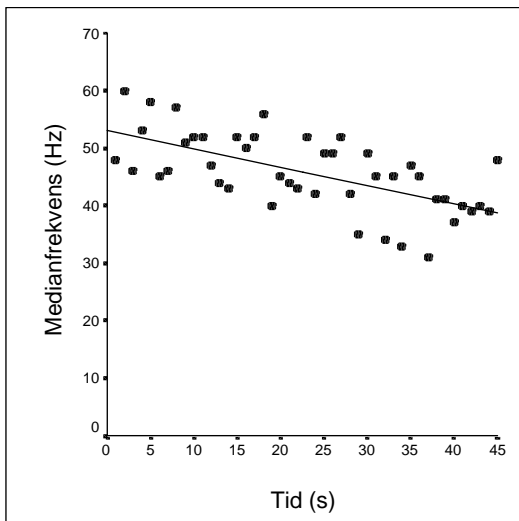
Under muskelaktivitet, d.v.s. när en muskel spänns (kontraheas), kan man registrera elektriska signaler från muskeln. Dessa kan mätas genom att små elektroder fästs på huden ovanför den muskel som ska undersökas. Våra studier inriktades på ländryggsmuskulaturen och elektroderna applicerades på ryggen bredvid den första och den femte ländkotan, på höger och vänster sida. Sammanlagt testades 57 patienter med långvariga ländryggsmärta och 73 ryggfriska personer. En del av de ryggfriska personerna deltog endast i våra studier av mätmetodens tillförlitlighet, medan 55 var jämförelsegrupp till ryggpatienterna.

Eftersom vi var intresserade av att undersöka muskeltrötthet, fick försökspersonerna göra ett riktigt rejält uttröttande statiskt muskelarbete. Detta skedde i en styrketräningsmaskin där försökspersonerna väl fixerades med ett bälte över höfterna och ett stöd över knäna. Sedan fick de pressa ryggen bakåt mot en rulle, i skulderbladshöjd, som inte rörde sig. På detta sätt kom de att spänna ryggmuskler utan någon rörelse. Pressen bakåt skedde med maximal styrka i 5 s, vardera i tre försök. På detta sätt kunde försökspersonernas maximala ryggmuskulstyrka mätas. I momentet därefter gjorde de en uttröttningskontraktion, d.v.s. pressade bakåt under 45 s med en kraft på 80% av den

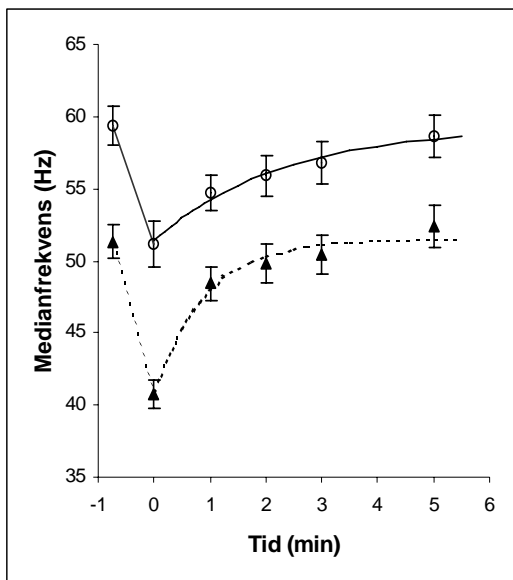
maximala. Under den efterföljande vilan på 5 min, satt de kvar i maskinen och fick göra en 5 s kort kontraktion varje minut. Denna korta muskelkontraktion gjordes för att vi ville undersöka återhämtningsförloppet och EMG kan bara registreras när en muskel är aktiv.

Den elektriska signalen, som registrerades från musklerna, kördes via förstärkare och elektroniska filter in i datorn där den analyserades med hjälp av ett datorprogram så att ett frekvensspektrum kunde erhållas för varje sekund som kontraktionen pågick. Vi valde sedan att använda medianfrekvensen (ungefär mitt-frekvensen) i varje spektrum. I ett diagram över erhållna data kan man se att medianfrekvensen sjunker under en muskelkontraktion som ett tecken på muskeltrötthet. Detta illustreras i figur 1 där varje punkt är medianfrekvensen under en viss sekund. En rät linje har anpassats till punkterna. Linjen har en viss *lutning*, och den kan vara brant eller flack. Värdet där linjen korsar den lodräta axeln har kallats den *initiala medianfrekvensen*. I figur 2 visas uttröttnings- och återhämtningsfasen. Återhämtningen har analyserats genom att anpassa en krökt (exponentiell) kurva till punkterna. Man får då en så kallad halveringstid, vilket är ett mått på hur snabbt återhämtningen går.

För att få reda på om man med mätmetoden skulle kunna särskilja patienter och ryggfriska, användes en statistisk metod som heter logistisk regression. Våra variabler var ryggmuskulstyrka, initial medianfrekvens, lutning och halveringstid. Resultatet av denna analys blev att ca 80% av patienterna och de ryggfriska klassades korrekt, dvs patienterna klassades som patienter och de ryggfriska som ryggfriska. Detta är ett relativt bra resultat.



Figur 1. Medianfrekvensen (registrerat i en av fyra elektroder) under en 45 s lång kontraktion av ryggmusklerna för en individ.



Figur 2. Den genomsnittliga medianfrekvensen under uttröttning (tiden $-0.75-0$ min) och återhämtning (tiden $0-5$ min) för 57 patienter (ringar) och 55 friska personer (trianglar).

Andra statistiska analyser vi gjorde visade att ryggmuskelstyrkan var signifikant lägre hos patienterna än hos de ryggfriska. Vid den femte ländkotan hade patienterna signifikant högre initial medianfrekvens (se figur 2). Lutningen var signifikant flackare för patienterna än för de ryggfriska, speciellt för de kvinnliga patienterna. Återhämtningsförloppet var långsammare för patienterna, vilket syns på den något flackare kurvan i figur 2.

Vad har då dessa skillnader i EMG för betydelse? För att få reda på detta ville vi se om det fanns några samband mellan å ena sidan EMG och å andra sidan olika fysiska aktiviteter och skattningar av hälsa. Patienterna hade därför fyllt i fem frågeformulär, där de bland annat skattade hur mycket deras ländryggssmärter påverkade hälsan, förmågan att utföra dagliga aktiviteter (t. ex. sitta, stå, gå, lyfta, bära, böja sig, klä på sig) och även självtilliten att klara dessa och liknande fysiska aktiviteter.

Det visade sig, att de patienter (33 st) vars mätvärden visade på mycket flack lutning, nära horisontell, hade signifikant fler begränsningar i aktiviteter och i självtilliten att klara dessa. Begränsningarna gällde t ex personlig omvårdnad (hygien, påklädning etc.), förmåga att lyfta tunga saker, böja sig ner eller gå ner på knä. Den sämre självtilliten gällde t ex hur lång tid man tror sig klara av att bära matkassar. Liknande begränsningar hade de patienter som inte fått något tydligt (exponentiellt) återhämtningsförlopp (25 st) och de vars värden visade på *både* flack lutning och otydlig återhämtning (19 st).

Dessa resultat tyder på att en brant lutning av medianfrekvensen under kontraktionen och en tydlig (någorlunda exponentiell) återhämtning är ett gott tecken. Ryggfriska personer uppvisade ju i högre grad detta mönster och även de ryggpatienter som hade minst aktivitetsbegränsningar. Skulle eventuellt en flack lutning och en otydlig återhämtning kunna vara förenat med någon avvikelse i muskelfunktionen? Ett sådant förhållande skulle kunna bero, antingen på att vissa muskelfibrer har förminskats i storlek på grund av ryggsmärta och sekundärt ändrat rörelsemönster, eller på att dessa patienter helt enkelt inte vågade "ta i" i testet på grund av rädsla för att smärtan skulle förvärras.

Således kan det tänkas att det är ett gott tecken att kunna aktivera sin ryggmuskulatur tillräckligt för att åstadkomma en uttröttning under ett sådant här test. Vidare forskning kan visa hur muskelfunktionen förändras med t ex styrketräning av ryggmuskulaturen hos patienter med långvariga ländryggssmärter.