

# Outcomes after quadriceps tendon repair in patients over 80 years of age

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## Summary

**Background:** Quadriceps tendon (QT) ruptures are uncommon and mostly occur in those who are 50-60 years of age. Timely surgical repair can result in a good functional outcome, however, little is known about the outcome in the older patient.

**Methods:** A retrospective review of all QT ruptures between 2009 and 2014 was conducted. Patients over the age of 80 were included. Those with penetrating trauma or partial ruptures were excluded. A chart review was undertaken to gather demographic and operative details. The patients were contacted by phone or by mail to have Lysholm and Rougraff scores completed.

**Results:** Of the 32 QT ruptures identified, 6 (19%) patients were eligible for inclusion in our study. They were predominantly (83%) males with a mean age of 81.38 years. The mean follow up was 54 months. The mean Lysholm score at last follow up was 84.8/100, which falls within the range of a good outcome. The mean Rougraff score was 21.3/25, which is an excellent outcome. All patients felt they were close to their premorbid level of mobility.

**Conclusion:** Good outcomes can be expected with QT repair in older patients, resulting in restoration of the pre-injury level of mobility.

**Level of evidence:** Level V case series.

**KEY WORDS:** elderly patients, outcome, quadriceps tendon rupture.

## Introduction

Quadriceps tendon (QT) ruptures are uncommon injuries that predominantly affect middle-aged men<sup>1</sup>. Ruptures most commonly occur from a powerful, eccentric contraction of the quadriceps muscle, when the knee is partially flexed and the foot is planted on the ground. This injury is most frequently caused by falls, however other mechanisms include direct trauma, lacerations, and iatrogenic causes<sup>2</sup>. Degenerative changes associated with ageing and calcific tendinopathy have also been shown to be a factor with QT ruptures<sup>3-5</sup>. Conditions such as diabetes, chronic renal failure<sup>6</sup>, gout<sup>7</sup>, and quinolone antibiotic use<sup>8</sup> amongst others have been shown to increase the risk of QT ruptures. Prompt surgical repair has been shown to result in good to excellent range of motion, and a return to sport in most studies. There is little data regarding the outcomes of QT ruptures in those 80 years or older. We reviewed the outcome of QT repair in patients in this age group.

## Materials and methods

A retrospective review was undertaken of all QT ruptures from 2009 to 2014. All patients, 80 years or older, with a QT rupture were included in the study. Patients with QT ruptures subsequent to penetrating trauma, conservatively managed partial ruptures, and bilateral ruptures, were excluded from the study. A review of the medical notes was undertaken to identify any risk factors known to be associated with QT ruptures. Pre-injury Lysholm<sup>9</sup> scores were compared with scores at a minimum of three years post-surgical repair. Statistical analysis was performed with the Student t-test using SPSS version 11.5 for Windows®, with a P value  $\leq 0.05$  considered significant. Rougraff<sup>10</sup> scores (Tab. I) were also collected at the most recent follow up. The study meets the ethical standards of the Muscle, Ligaments and Tendons Journal<sup>11</sup>.

## Results

A total of 32 QT ruptures were identified during the study period. Six patients met the inclusion criteria and were predominantly male (83%), their mean age was 81.38 years (80.3-82.08). All the patients sustained the QT rupture secondary to a fall. Two pa-

Table I. The Rougraff score.

Outcome Measure	Score (min=1, max =5)				
	1	2	3	4	5
Overall satisfaction	very poor	poor	fair	good	very good
Knee strength	very poor	poor	fair	good	very good
Knee movement	very stiff	stiff	reduced	almost normal	normal
Ability to climb stairs	never	with assistance	one step at a time	normal with bannister	normal
Pain	constant	frequent	occasional	rare	never

tients required an ultrasonogram to confirm the QT rupture, as the accuracy of clinical exam was restricted due to pain and a large haemarthrosis. The remaining four patients had the classical features of pain, loss of knee extension, and a suprapatellar gap. Radiographic features included: the obliteration of the quadriceps tendon shadow; a patella baja (low riding patella) with an Insall-Salvati index of <0.8; a patellar tilt; a visible suprapatellar soft tissue mass due to the retracted tendon; and an osseous avulsion fragment from the proximal pole of the patella (Figs. 1, 2). There were no bilateral QT ruptures in this series. All patients underwent surgical repair within 3 days of the rupture. QT repair was carried out using patellar drill holes and trans-osseous suture repair in 4 cases. An end-to-end repair using a Krackow whipstitch with a non-absorbable braded suture was used in the remaining two.

Post operatively the patients were mobilised fully weight bearing, with the knee locked in full extension using a brace for 2 weeks. Range of motion was then gradually increased over the following four weeks. One patient had a superficial infection, which was successfully treated with a course of oral antibiotics. Mean follow up was 54 months (42-74 months). Mean Lysholm score pre-operatively was 90.5/100(73-100), and at last follow up was 84.8/100(62-96), which falls within the range of a good outcome. There was no significant difference ( $p=0.21$ ) between the pre-injury

and most recent follow up Lysholm scores. The mean Rougraff score was 21.3/25, which is an excellent outcome. The patient demographic and outcome data are listed in Table II.

## Discussion

QT ruptures are uncommon and typically occur in the middle aged male patient. Patients are living longer and more importantly are more active in their latter years. As a result of this, QT ruptures in this population are likely to increase. There is very little data regarding the outcomes of QT repair in the older age group. Our study revealed that almost a fifth of the QT ruptures in our cohort occurred in those aged over 80 years of age. All but one described themselves as very active and healthy in their day-to-day lives.

Only one patient, Patient-5, had risk factors associated with QT ruptures which were gout and renal failure. This patient was also the oldest in this cohort at 82.08 years of age, with a background of chronic obstructive pulmonary disease that was primarily the limiting factor of her mobility. Patient-1 has a background history of peripheral vascular disease, which he felt was the main reason for limitation of his mobility. All patients were very satisfied with the surgery and its outcome. All but one patient felt they were

Table II. Patient demographic and outcome data.

	Age	gender	side	Risk factors	Repair type	Follow up	Lysholm score		Rougraff Score
							Pre Injury	Post injury	
1	81.75	M	L	nil	End to end	42	73	69	20
2	81.42	M	L	nil	Transosseous	74	100	96	23
3	81.58	M	R	nil	Transosseous	51	95	90	22
4	81.17	M	L	nil	End to end	69	100	95	23
5	82.08	F	R	Renal Failure Gout	Transosseous	46	80	69	18
6	80.31	M	L	nil	Transosseous	43	95	90	22

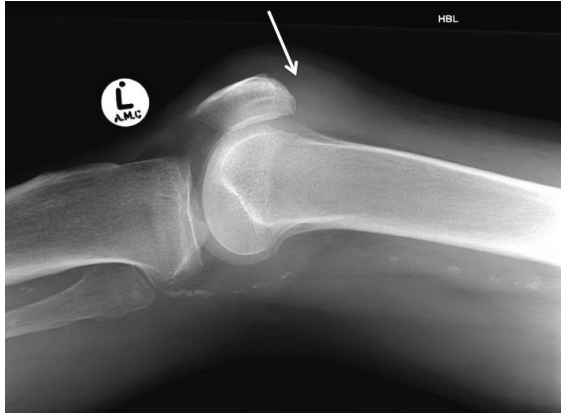


Figure 1. Lateral radiographs of knees with quadriceps tendon ruptures. Figure 1 displays obliteration the quadriceps tendon shadow, a haematoma (solid arrow), and a low lying patella (patella baja).

back to their pre-injury levels of mobility. The remaining one patient, Patient-5, felt she was limited by her medical co-morbidities more than the QT rupture. Knee pain and instability were not a significant limiting factor with any of these patients.

The most common surgical techniques for quadriceps tendon repair in acute setting are simple end-to-end sutures and patellar drilling holes<sup>12</sup>. Wenzl et al. have shown that either technique had no influence on the final outcome<sup>13</sup>. Both techniques were used in our patients with similar outcomes, however, the numbers are too small to make a conclusion with statistical significance. One patient had a superficial wound infection post operatively which resolved with a course of oral antibiotics. No other complications were noted. There were no re-ruptures in these patients.

The mean Lysholm score is 84.8, which is within the range of a good outcome and the mean Rougraff score is 21.3, which is an excellent outcome. While the older patient might be considered to be lower demand, these scores are similar to a recent study by Verdano et al. focusing on those under the age of 60 with presumable higher demand and activity levels<sup>14</sup>. A 3-month follow up study by Puranik et al.<sup>15</sup> on 21 QT ruptures with a mean age of 66.2 years demonstrates good outcomes, as does a recent longer term 6 year follow up study by Boudissa et al.<sup>16</sup> of 50 QT ruptures with a mean age of 55.2 years. The outcome scores in our study group are similar to those reported by these studies.

There is a number of limitations to this study. While the small number of patients in this cohort is of chief concern, this is still the largest study to date, that we are aware of, focusing on the older age group. Other limitations include limited data regarding range of motion and quadriceps strength, and the fact that patients were not investigated for metabolic disease<sup>17</sup>. While all patients had a minimum of 90° flexion and were within 5° of full extension during follow up, range of motion was not recorded in all the patients at the last outpatients review. As some were contact-



Figure 2. Displays patellar tilt, and again loss of the quadriceps tendon shadow.

ed by telephone for the most recent outcome scores, range of motion could not be captured on all patients. Objective strength measurement with isokinetics was not possible for the same reason. It is worth noting that while all patients were enthusiastic about participating in the study, most wanted to avoid an unnecessary visits to the hospital.

## Conclusion

As patients live longer and more active lives, QT ruptures in older patients are likely to become more frequent. Good outcomes can be expected with QT repair in patients over the age of 80 years, resulting in restoration of the pre-injury level of mobility.

## Conflict of interests

The Authors have no financial involvement and have no conflicts of interest.

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