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Rehabilitation Providers' Perspective on Recovery Following Autologous Chondrocyte Implantation: A Qualitative Study

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Abstract

Background: Autologous Chondrocyte Implantation involves a lengthy recovery process. Rehabilitation providers have an opportunity to positively influence outcomes.

Aim: To explore and describe the experiences of rehabilitation providers' experiences during the rehabilitation process following autologous chondrocyte implantation (ACI) and to determine what strategies they employ to improve outcomes, encourage rehabilitation adherence, and establish positive therapist-patient relationships.

Design: Qualitative Study.

Setting: Various Physical Therapy Clinics.

Population: Seven physical therapists from urban and rural settings who had prior experience treating patients that had undergone ACI.

Methods: Semi-structured interviews were conducted with each participant. Participants were asked to describe their experiences treating patients that had undergone ACI. The process of horizontalization was used to extract significant statements and develop themes.

Results: Five themes emerged that addressed the rehabilitation providers' role in facilitating recovery, patient responsibility, and the collaborative nature of recovery, importance of patient education, and psychosocial barriers and facilitators.

Conclusion: The relationship between a rehabilitation provider and patient is important and can have a direct impact on outcomes. Adopting a patient-centered approach is best done by devoting time to patient education, managing expectations, encouraging compliance to treatment, assessing self-efficacy, providing feedback, and promoting a collaborative environment.

Keywords: Autologous Chondrocyte Implantation; Rehabilitation; Cartilage; Knee; Rehabilitation; Qualitative

List of abbreviations: ACI: Autologous Chondrocyte Implantation

Introduction

There are multiple factors that influence outcome following autologous chondrocyte implantation (ACI), including patient characteristics, defect characteristics, previous surgical history, patient expectations, and post-operative rehabilitation [1-3]. It has been emphasized that a lengthy rehabilitation period is necessary for successful return to function following ACI [4-7]. The development and progression of a rehabilitation program is a unique challenge for patients and therapists alike as these programs are often very time-consuming and must be highly individualized. At the current time, there is minimal evidence for the development and progression of rehabilitation following ACI. Guidance for the progression of rehabilitation is based almost entirely on expert opinion, basic science and the biomechanics literature [6]. This lack of evidence for optimal rehabilitation and a fear of graft failure may lead to an overcautious approach to ACI rehabilitation [8].

Rehabilitation following ACI is meant to facilitate recovery and rehabilitation providers have a unique opportunity to positively influence outcome. Since the recovery process following ACI is a lengthy one, there is a high level of interaction that occurs between patient and therapist. The relationship between the patient and therapist has been studied extensively and is viewed as an important contributing factor to overall outcome. The term "alliance" refers to this relationship and describes the concept of collaboration, warmth and support that occurs between the patient and therapist [9,10]. The therapists' behavior and communication skills can have a significant impact on this relationship by improving patient satisfaction, treatment compliance, and ultimately outcome [11,12]. In a recent systematic review, the therapist-patient relationship was found to have a positive effect on treatment outcome following rehabilitation in patients with a variety of medical conditions. Specifically, this therapist-patient alliance positively influenced rehabilitation adherence, patient satisfaction, and physical function [9].

Autologous chondrocyte implantation is not a common procedure and thus may be unfamiliar for many rehabilitation providers, particularly therapists practicing in rural settings with limited access to the treating physician. Furthermore, therapists with less experience may not be able to draw from past clinical experiences or challenges if they have minimal experience treating this specific patient population. Therapist confidence for predicting patient outcomes is often-times related to knowledge that occurs over many years of experience [13]. A greater understanding of what makes therapy work from providers' that have experience treating patients following ACI may provide valuable information for therapists with limited knowledge and experience in this area.

To assist rehabilitation providers' to develop the tools necessary to effectively treat patients undergoing ACI, it is important to identify what strategies are used and how challenges are managed during the recovery process. To date, we are unaware of any studies that describe the experiences and perspectives of therapists' providing care to patients following cartilage repair of the knee. Therefore, the purpose of this qualitative study was to explore and describe the experiences of rehabilitation providers' experiences during the rehabilitation process following ACI and to determine what strategies they employ to improve outcomes, encourage rehabilitation adherence, and establish positive therapist-patient relationships.

Materials and Methods

The qualitative methodology, phenomenology, was used because it offers an approach by which to identify a phenomenon (ACI rehabilitation) and how it is perceived by participants (therapists). This type of methodology allows for gathering of 'rich' information through inductive, qualitative methods such as interviews and participant observation. Phenomenology is concerned with the perspective of the individual experiencing the phenomena of interest and provides insight into participant's motivations and actions [14].

Participants

This study was approved by the University of Kentucky Institutional Review board. Participants were chosen through purposeful sampling in an effort to represent therapists working in both the urban and rural settings. A previous retrospective chart review identified rehabilitation providers providing services to patients who had undergone ACI from a single orthopedics practice [15]. To meet eligibility criteria for the study, participants had to be licensed physical therapists in the state of Kentucky with prior experience treating patients who had undergone cartilage repair of the knee and be fluent in the English language. Information was provided both verbally and written, and participation was voluntary. Informed consent was obtained prior to the initial interview. Patients were assured of confidentiality and pseudonyms were used to protect anonymity.

A total of seven therapists agreed to participate in the study. Average number of years of clinical practice was 16 years, with a range of 6-30 years. Participants had treated an average of 13 patients undergoing ACI (range, 2-40 patients). Four of the participants practiced in urban settings while the remaining three participants worked in a rural setting within the Commonwealth of Kentucky. For more detailed information on participants, refer to Table 1.

Subject	Clinical Setting	Years of Clinical Practice	Approx. # of ACI Patients Treated
"Jeremy"	Urban	9 years	30
"Luke"	Rural	21 years	40
"Matthew"	Rural	6 years	3
"Anna"	Urban	12 years	10
"Natalie"	Urban	6 years	2
"Ashley"	Rural	30 years	3
"Kristen"	Urban	28 years	5

Table 1: Participant Characteristics

Data Collection and Analysis

Data collection was performed through semi-structured interviews conducted by the primary author (JLT). Each interview lasted between 30-60 minutes and took place in a quiet location chosen by each participant. Participants were asked to describe their

experiences treating patients that had undergone ACI. An interview guide was developed for use during the interviews (Appendix 1). Open-ended questions were developed based on the research objective and included general concepts to be explored during the interview. The purpose of the semi-structured interviews was to gain a better understanding of the rehabilitation process from the perspective of treating clinicians. Furthermore, the open-ended interview guide was used to maintain consistency during the interview process among all participants. Interviews were conducted until data saturation was reached. Data saturation occurs at the point in which no new information is being heard during the interview process [16]. All interviews were recorded and transcribed verbatim.

To understand the experiences and perspectives of therapists providing care to patients recovering from cartilage repair of the knee, a data analysis approach was used that encourages reflection and interpretation. This analysis, termed horizontalization, is a 6-step methodological approach based on work by Colaizzi [17]. Following transcription of the data, the transcripts were read several times in order to get an overall sense of the participants' perspective. Next, researchers selected significant statements from each transcribed interview that described the experience of providing care to patients recovering from ACI. Each significant statement was a direct quote from participants. Once significant statements were extracted, duplicate statements were removed from the analysis. The process of horizontalization was used to help with the organization of the remaining significant statements. Horizontalization is a process whereby all statements are treated as having equal value or significance [17]. Following extraction of significant statements from each transcript, researchers assigned a formulated meaning to each statement, thereby providing an interpretation of each significant statement. These formulated meanings were organized into clusters of themes, which were used to provide a full description of the participants' experiences. Finally, these themes were distributed to all participants (member-checks) for their feedback as a means of validating these findings.

Rigor

Several methods were used to establish scientific rigor. First, member-checks were used during data analysis to ensure that we were providing an accurate description of the participants' experience. Participants were asked to affirm that the results either reflected their experiences or did not reflect their experiences. Through member-checks, participants in this study affirmed the accuracy and credibility of the findings. Secondly, all interviews were transcribed verbatim and direct quotes from participants were used to enhance credibility of the study [18]. In addition, a researcher experienced in qualitative research reviewed the interview protocol and was available to review and challenge the emerging interpretations of data. This expert checking further acted to minimize insider bias in the interpretation of the results. Finally, epoche, or 'phenomenological bracketing', was used to demonstrate validity of the data collection and analysis process. As a researcher who is also experienced in orthopaedic rehabilitation, there were concerns relating to "insider bias" [19]. Throughout the interview process, the researcher made every attempt not to influence the interviewees or make assumptions regarding the recovery process following ACI. In epoche, the researcher must put aside his or her own beliefs, attitudes, assumptions, and experiences so as not to influence the participants' understanding of the phenomenon. This methodology, common in phenomenology, allows for a more accurate description of the participants' experiences and allows the researcher to look at the topic with a fresh eye.

Results

Significant Statement (Step 2 of data analysis)	Formulated Meaning (Step 3 of data analysis)
"I think what we try and instill in the patients is number one what we do here is important; what you do outside of here is probably more important as far as are you doing what we are asking for." (Transcript 1, page 6, lines 217-221)	Rehabilitation is an important part of recovery following ACI, but the patient's compliance with the guidelines is more important.
"But I think the biggest thing early-on with the process is it's got to be slow and there has to be good patient feedback." (Transcript 1, page 5, lines 176-178)	Patient feedback regarding the recovery process is an important component of therapy following ACI.
"So these patients seem to be very apprehensive about every little pain and everything. And letting them know that all those hurts don't necessarily equal harm." (Transcript 1, Page 10, lines 358-361)	Assuring patients that pain does not indicate harm helps to alleviate their apprehension about the recovery process.
"It's just that this process is going to take a long time. It's going to take months and we're only half way through that. And you need to just kind of move forward as we progress you forward. And they hung in there. They all kind of hung in there." (Transcript 3, page 8-9, lines 284-288)	Recovery following ACI is a long process and it can be difficult for patients to see the progression.

Table 2: Selected Examples of Significant Statements of Therapists' Experiences and Corresponding Formulated Meanings

A total of 137 significant statements were identified from seven transcribed interviews and a total of 21 formulated meanings developed through the process of horizontalization. Table 2 provides specific examples of significant statements (direct quotations) and their corresponding formulated meanings. Five themes emerged from the formulated meanings: 1) facilitating recovery, 2) recovery is the patient's responsibility, 3) the collaborative nature of recovery, 4) utilizing patient education to maximize outcomes, and 5) psychosocial factors influence recovery. Each theme is described below, using verbatim quotations from participants. The selected quotations deliver support and meaning to each theme, while also providing context and perspective to the participants' experiences (Table 2).

Theme 1: Facilitating Recovery

Participants recognized that their role during ACI rehabilitation was one of a facilitator, emphasizing that it was the patient that was ultimately responsible for their recovery. As a facilitator, participants discussed their role in motivating, encouraging and educating patients throughout the recovery process. Jeremy spoke about his role guiding and facilitating the recovery process:

"I say, who is going to get you better? And they usually point at me and I shake my head and say no. My job is to facilitate your recovery. If you need me, I'm there for you. My job is a facilitator. You are the one that is going to get your knee better. We'll help you and tell you what to do. If you need the push of the manual treatments, modalities, that's what we're here for. But ultimately you are the one that is responsible for your own recovery. It's your knee. My knee feels great. I don't have any problems with my knee."

Participants acknowledged that it was a challenge as a facilitator to empower patients to be responsible for their recovery. One of the tools that participants found to be effective was explaining the recovery process in terms that patients were able to understand. Kristen said,

"But even other chunks of life are if you can explain why sometimes and you can put it in a context that makes sense for the patient; and you can relate to that patient specifically not just kind of a general relate to them. That seems to work better."

Educating and relating to patients helps assure them that they are progressing as expected. According to Matthew, this was an important part of his role as a facilitator:

"Because it was a slower rehab with most of these people, I think our role is to assure them that they were doing the right thing and that they shouldn't be progressing any faster than they were. I think kind of letting them know that what they're doing is sufficient."

By educating, motivating and encouraging patients, participants hoped to be able to provide patients with the tools for driving self-care and self-management and continue their recovery beyond formalized therapy.

Theme 2: Recovery is the Patient's Responsibility

While the therapist serves as the facilitator during rehabilitation, they acknowledged that recovery is ultimately the responsibility of the patient themselves. In order for the patient to be successful in rehabilitation, they must be compliant with their home exercise program, possess an understanding and knowledge of the healing process, and buy into the recovery process and their role in it. Kristen emphasizes the patient's role in the recovery process:

"The patient's role is taking responsibility for their recovery process and understanding that in the long run it is their knee. And not my knee and not the surgeon's knee."

Part of the patient's responsibility is being prepared for the recovery process. A part of this preparation is knowledge of the process and how recovery will affect their lives. Matthew said:

"I think they bear the brunt of the responsibility. They have to be informed and understand what they are getting into. I think they need to know that the rehab is not a quick fix. I think they have to be prepared mentally and I think they have to be prepared socially and economically to have this type of surgery because a lot of people may not be able to afford the six, eight months off of work that it would take".

Compliance with home exercises was an area that all therapists agreed was an important part of the recovery process and ultimately the responsibility of the patient. Although compliance is the patient's responsibility, participant's acknowledged that their role as a facilitator was to help patients buy into the recovery process as this had the potential to influence their perseverance with home exercises in the long-term. Furthermore, when patients were compliant with their home exercises, they were able to meet short-term goals which improved their motivation and outlook. Jeremy talked about the importance of patient buy-in and his role in facilitating their cooperation and motivation with therapy:

"But buy-in more than anything is crucial because if they're actually doing things at home then they're going to make their strength gains and they're going to make their range of motion gains and everything else will fall into place. As far as patients I want is ones that are able to buy-in and understand that the home component is very important with this. And again, I try to empower them to do that."

Several of the participants acknowledged that overall, patients were very committed to the recovery process, including compliance with their home program. However, participants also recognized that patients lost their motivation and compliance over time

given the lengthy recovery process. Four of the participants stated that patients become frustrated around three months post-operatively because they tend to plateau with their functional gains. And this often affected their motivation and compliance with rehabilitation. Natalie recognized this plateau in several of her patients:

"I think in a lot of cases, it [plateau] coincides with the end of formalized therapy but even if they are still participating in therapy I think they're maybe not as compliant at home, maybe they're losing some of the enthusiasm and motivation. Especially when it's such a long process. If a patient has a strong sense that they are in control of their situation, I think they do better than somebody who perhaps feels like they don't have any control over their situation and then they've got this 12-month long rehab process that they're not in control of."

Recovery following ACI is a lengthy process and patients generally participate in formalized therapy in the short-term. However, if patients are to have successful outcomes in the long-term, it is important for them to understand that they are ultimately responsible for their own recovery. An important component of this responsibility is compliance with home exercises once formalized therapy has ended. Therapists, as facilitators of recovery, must provide patients with the tools and knowledge to manage recovery on their own.

Theme 3: The Collaborative Nature of Recovery

While participants recognized their role in the recovery process, they acknowledged that recovery is a team effort and collaboration between themselves, the patient, and the surgeon is critical to a successful recovery. An important part of this collaboration is information sharing, which may help therapists to develop the most effective and individualized treatment plan. When information is missing, participants acknowledged that it was their responsibility to obtain this information. Luke said,

"Sometimes there is information that only the doctor knows that might be helpful. One thing we do, is we always request the operative report. And that way we're on the same page. We see where the issue is topographically. So that gives us a great deal of information."

The participants also acknowledged that collaboration during the recovery process helps with patient buy-in. Ashley spoke about the importance of this collaboration in developing a relationship with the patient:

"So we help to collaborate with the doctor and the team to make sure that what they want and what they want to see the patient do that that is being carried out. Because most of the time we do have a relationship with these patients and you know, so. I think that's helpful just to keep hearing it and hearing it."

Successful communication between the surgeon and therapist may also improve the therapist's confidence level in progressing function and establishing appropriate goals for the patient. Since ACI is not a common procedure, therapists may not be familiar with the restrictions and treatment approach. Collaboration, therefore, is critical for progressing the patient safely and effectively.

Theme 4: Utilizing Patient Education to Maximize Outcomes

In addition to their role as facilitators of recovery, participants also emphasized the importance of patient and caregiver education during the recovery process. While patient education is an important component of any rehabilitation program, participants emphatically agreed that it is extremely critical following ACI given the time necessary for tissue healing. Educating both patients and their caregivers prepares patients for recovery and helps them to manage expectations on the front end. Natalie agreed that pre-operative education needs to be more of a focus in this patient population:

"I think they could take a page out of the total joint book. Because with total joints there is a lot more education on the front end both for patients and families. I don't think that family's expectations are where they need to be and I don't know what role that plays in the patient's motivation. But a lot of education up front. You know the joint, a lot of joint programs have them go to a class or school. I think that they should be required for a couple of pre-operative visits with the surgeon to discuss the procedure, to discuss the rehabilitation, maybe even have pre-op visits with the therapists so that we have the opportunity to reinforce what the physician has explained to them."

An important component of patient education from the participants' perspective was in helping to alleviate the patient's fear of the unknown. All participants acknowledged that at some point during recovery, patients are either nervous or apprehensive about damaging their knee. Part of this fear is that the patient does not fully understand the healing process and the timeline. Jeremy talked about the anxiety that many of his patients are expressed:

"Patients are often a little bit nervous about the process because again it's a little different. You're taking cartilage and sending it where? And we're going to get it back and put it back into my knee and then it'll grow? So they're a little nervous about the process because it's a little different than some other knee scope".

By educating patients on the procedure and the healing process, therapists are able to alleviate some of those concerns and instead focus on the recovery itself. Pre-operative patient and caregiver education, whether formal or informal and the addition of prehabilitation helps patients to make informed decisions regarding the timing of the procedure, alleviates any concerns regarding the procedure and the subsequent rehabilitation, and helps to manage their expectations. An understanding of the procedure

and the recovery process can influence patients' motivation and cooperation with therapy, which may ultimately influence their outcome.

Theme 5: Psychosocial Factors Influence Recovery

The final theme that emerged was the influence of psychosocial factors on the recovery process. Participants emphasized the importance of personality traits such as intrinsic motivation in influencing outcome and adherence with rehabilitation. Luke spoke about the role of motivation during the recovery process:

"And that's the key on what your outcome is going to be. And so far the ones I've had have been pretty motivated. Although I had one a few years ago that wasn't [motivated] and I knew he was going to be a train wreck from day one. He was gonna take care of himself. He didn't care."

Depending on the patient's mentality towards the recovery process, the therapist may need to adjust and alter their treatment approach in an effort to provide assurance or instruction. Natalie described the difference in approaches taken based on the patient's mentality towards recovery:

"I think some patients really assume that patient mentality and they want their hand held and I think other patients are more independent and they just need an occasional pat on the back saying you're doing what you need to be doing, keep doing it. Sometimes I need to be right there with them hand holding and making sure they know that. This pain they are having, that is normal pain, and that is to be expected. And not to be afraid of that. That you're not doing damage. And then other patients, I almost have to pull the reigns in on them and say wait a minute you don't need to be doing that. You might be causing damage. I know you're doing well with your exercises but we need to slow it down a little bit."

In addition to facilitating recovery from a physical and functional standpoint, therapists also influence recovery from a psychosocial standpoint, encouraging motivation, independence, and compliance with the recovery process.

Discussion

This study sought to examine the perspectives of therapists providing rehabilitation services for patients undergoing ACI. Because of the extensive time that rehabilitation providers spend with patients post-operatively, they provide a unique perspective on the recovery process. The results of this study indicate that the role of the rehabilitation provider is to facilitate recovery through education, guidance, and managing the psychosocial needs of the patient. The patient, on the other hand, is ultimately responsible for their own recovery. This implies knowledge of the recovery process, motivation, and the willingness to adhere to the post-operative guidelines, both in the short-term as well as in the long-term.

One of the biggest challenges of ACI rehabilitation is the length of the recovery process. It has been estimated that full maturation of the repair tissue takes two years [6,20]. However, as a result of insurance restrictions, patients are oftentimes only participating in formalized rehabilitation for several months following surgery. Therefore, the time spent in formalized therapy is critical for shaping patients attitudes and beliefs regarding their role in the recovery process and to provide patients with the tools to influence their health and behaviors. It has been suggested that the relationship between the therapist and patient has an important influence on outcome. The potential effects of this relationship occur through patient education, adherence to treatment, self-efficacy and the patient's perception of control [21]. The findings of this study demonstrate that rehabilitation providers consider each of these areas important for influencing outcome in patients recovering from ACI.

One of the fundamental findings from this study was the importance of patient education throughout the recovery process. During recovery, participants considered themselves facilitators of recovery. Patient education is one way in which participants are able to facilitate recovery. The aim of patient education is to influence patients' knowledge and health behavior so that they are able to assume an active role in the management of their own recovery [22]. It has been demonstrated that patient education occurs in nearly all therapist-patient encounters. In a study of Dutch physiotherapists, 97% of treatment sessions included some form of patient education [23]. Patient education, regardless of the approach has the ability to positively influence adherence to treatment. While patient education following ACI is important for influencing behavior, increasing knowledge, and improving adherence, the timing of patient education is equally important. Pre-operative education is common practice in many orthopaedic surgical procedures, including total joint arthroplasty. However, formalized patient education is not the current standard of care for patients undergoing ACI.

The participants in this study all agreed that patient education was critical during the recovery process; however, they also believed that patients would benefit from more formalized pre-operative education. Evaluation of pre-operative education programs has demonstrated that patients who are more educated regarding the recovery process are more likely to actively participate in their care [24]. In addition, pre-operative education has been shown to have a positive effect on post-operative outcome. Specifically, 67% of patients receiving pre-operative education had more favorable outcomes and their outcomes were 20% better than patients not receiving any pre-operative education [25]. Given these findings and the recommendations expressed by all of the participants, pre-operative patient education should be developed, in the form of classes or videos, for patients (and caregivers) undergoing ACI. Pre-operative education should be modeled after total joint arthroplasty that allows clinicians to assess their knowledge and

expectations, answer questions, and provide patients with information regarding the surgical procedure as well as an exercise booklet which includes precautions and exercises to be performed post-operatively [24]. In addition, patients should undergo a period of pre-habilitation in an effort to prepare them both physically and mentally for surgery.

A common thread amongst all participants in this study was acknowledgement that recovery is ultimately the responsibility of the patient. While the participants recognized their role in facilitating recovery, providing guidance, and educating the patients, they all agreed that it was the patient's responsibility to manage their recovery. An important component of this role is compliance and adherence to their treatment program. Many of the participants noted that patients undergoing ACI are compliant with their treatment plan in the short-term, but that due to the lengthy recovery process, patients have a difficult time maintaining their adherence in the long-term. Patient compliance is important in physical therapy because treatment effects depend on it. However, research indicates that up to half of patients are noncompliant with exercise [26,27]. There are a multitude of factors that may be related to patient compliance. Previous research has demonstrated that patients with an external locus of control are less compliant than patients with an internal locus of control. In other words, patients who believe that recovery is not dependent on their own behavior or actions appear to be less compliant to treatment plan [28]. To date, only one study has investigated patients' expectations and knowledge regarding ACI. In this study, patients undergoing ACI were asked to provide the relative importance of different factors on clinical outcome. Factors included defect characteristics, personal risk factors (e.g. age), quality of the surgery, previous surgeries and treatment, and post-operative rehabilitation. Interestingly, only 7.6% of patients considered post-operative rehabilitation an important factor for influencing clinical outcome. The majority of the patients believed that their outcome was determined by factors outside of their control [29]. This has significant implications for adherence, especially in the long-term.

Another factor that has been shown to influence compliance is feedback and supervision. Patients who are provided with positive feedback and whose compliance is being monitored are more likely to comply with instructions than patients who are unsupervised and do not receive consistent feedback [30,31]. Supervision in the long-term is difficult, given insurance restrictions and the length of the recovery process. However, several of the participants in this study offered patients an opportunity to participate in a "wellness program", in which patients pay a small monthly fee to use their facilities during established hours. The benefit of a wellness programs is that it provides accountability and offers patients' access to their rehabilitation provider should any questions or issues arise.

It is no surprise that recovery is influenced by psychosocial issues. Participants in this study identified motivation, degree of self-efficacy, and locus of control as potentially influential factors determining success following ACI. Self-efficacy, or the belief in one's ability to produce a desired action, has been associated with positive outcomes [32-34]. Even in patients with successful outcomes, however, lower levels of self-efficacy may exist. This may be due to patients attributing their success to factors outside of their control, such as the quality of the surgery. Furthermore, when patients feel helpless about trying to change their behavior or influence their health, motivation may decrease [21]. Therefore, it is important for rehabilitation professionals to recognize a patient's effort as their own effort but also to encourage a sense of control over their problem.

One of the final themes to emerge from this study is that participants viewed recovery from ACI as collaborative in nature. Recovery does not happen alone; rather, it requires a cooperative effort between surgeon, patient, therapist, and caregiver(s). An important aspect of effective collaboration, as acknowledged by many of the participants in this study is quality communication. There is evidence that effective communication between the surgeon and patient can positively influence outcome [35]. This interaction between physician and patient, however, is often brief. Rehabilitation providers spend significantly more time with patients and therefore have an advantage in establishing rapport and influencing the patient's behavior and attitudes. Participants in this study also emphasized the importance of effective physician-therapist communication. This is particularly important for therapists practicing in rural settings with limited access to the treating physician and when therapists are unfamiliar with a procedure or rehabilitation protocol. Participants in this study that were unfamiliar with the protocol or the physician's expectations acknowledged that it was their responsibility to initiate communication with the physician to obtain additional information, such as the surgical report. Having the appropriate information available allows therapists to provide more individualized care.

Given the findings from this study and the available literature, there are several tools that rehabilitation providers can use to improve adherence, self-efficacy, and motivation in patients undergoing cartilage repair of the knee. As mentioned previously, a formalized pre-operative education program in conjunction with pre-habilitation should be provided for patients undergoing ACI. In addition, therapists' should be given access to surgical reports that indicate the exact size and location of the lesion. This information, combined with a thorough knowledge of the patient's expectations, will allow therapists to tailor the rehabilitation program to an individual's situation. Assessing patient's self-efficacy and adherence to their rehabilitation program can be assessed through the use of validated instruments. For example, the Sport Injury Rehabilitation Adherence Scale (SIRAS) is a 3-item measure in which clinicians' rate patients' intensity of completion of rehabilitation exercises, the frequency with which they follow the clinician's instructions, and their receptivity to changes in the rehabilitation program [36,37]. Patient self-reports of adherence can be measured using a 10-point Likert scale, where 0=none and 10=exactly as prescribed. The Self-Efficacy for Rehabilitation Outcome Scale (SER) is a 12-item measure designed to measure patients' beliefs about their abilities to perform activities in rehabilitation. By assessing adherence, therapists can adjust the feasibility of the exercises and adapt them as necessary. In patients

with low levels of self-efficacy, therapists can establish realistic and attainable goals and provide feedback. Providing consistent feedback throughout the recovery process can also assist with improving adherence. Finally, there are several factors to consider for improving long-term compliance with exercise programs. Physical therapy clinics should consider offering a wellness program for patients that require extensive recovery time. When wellness programs are not an option, follow-up encouragement and input from the therapist may be beneficial.

Study Limitations

While this study contributes to the understanding of the recovery process following ACI from the perspective of the rehabilitation provider, it is difficult to generalize the findings and experiences of these participants to others who have provided care for patients with similar conditions. However, we selected participants with varying experiences with ACI patients as well as participants from both urban and rural settings in an effort to represent a more heterogeneous group of therapists. While these results may be limited to the views of the participants, results suggest that further exploration of pre-operative patient education programs and inclusion of outcome instruments for measuring adherence and self-efficacy is warranted.

Conclusion

This study aimed to describe rehabilitation providers' experiences during rehabilitation in patients recovering from ACI. We identified five themes that emphasized the role of the therapist as a facilitator in the recovery process, the responsibility of the patient to comply with treatment and manage their own recovery, the importance of patient education, the collaborative nature of recovery, and the influence of psychosocial factors on recovery. The relationship between the therapist and patient can have an important influence on outcome. Adopting a patient-centered approach is best done by devoting time to patient education, managing expectations, encouraging compliance to treatment, assessing self-efficacy, providing feedback, and promoting a collaborative environment. Including these methods within a rehabilitation program will increase a patient's sense of control and enable them to take an active role in their own recovery.

Appendix

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