Tomohiro Terao and Yutaka Kuroda
The world's first bone regeneration project "Clinician x Medical Researcher Team"
"Regenerative therapy for the patients with osteonecrosis of the femoral head after COVID-19"

Dr. Kuroda and I are currently engaged in an innovative bone regeneration project. The unique two person team is a collaboration between a medical researcher and a clinician. Our project activities are in a pre-business state. However, we are currently receiving funding from Kyoto University's incubation program, and plan to incorporate by the end of 2021. We are here today to share our initiatives in the hope of finding those who are interested in joining our team.
We are both orthopedic specialists who are involved in regenerative medicine. However, our backgrounds slightly differ. Dr. Kuroda is active not only in the research of regenerative medicine and intractable diseases, but also has extensive experience as a surgeon. On the other hand, I have been active in the use of stem cells for regenerative medicine since 2010. I am also involved in the legality of the field as a member of the Committee for Regenerative Medicine. Although we have different backgrounds, we share a mutual belief – "new treatments are taking too long to reach the public." We launched our project in an effort to leverage Japan's regenerative medicine institutions, to provide patients with brand new medicinal treatments as quickly as possible.

The two of us have conducted extensive research to provide a solution for an intractable disease called Osteonecrosis of the femoral head, known as ONFH. This disease occurs when a bone in the hip joint undergoes necrosis and is often caused by steroid therapy. When bone tissues die, joints deform. This produces a sharp pain and makes movement difficult, hindering everyday life. Unfortunately, this disease rarely cures itself naturally. Because onset of this disease occurs in young patients from 20 to 40 years of age, patients experience pain over a long period of time, and it inflicts significant negative ramifications to our society. The most common treatment for ONFH is to replace the dead tissue through Total Hip Arthroplasty, or THA for shorthand. Unfortunately, the prosthetics wear out over time so if you receive the surgery at a young age, you will have to undergo replacement surgery numerous times. Clearly, this negatively impacts the patient's quality of life.
From a medical cost perspective, if you undergo THA at a young age, the medical expenses are estimated to exceed 10M Japanese yen over your lifespan. This expense is a significant burden on social welfare costs. As such, it is imperative that we provide a medical solution that regenerates the dead tissue so that patients can live life with their original joints. The outcome would be both a lower tax burden on society and a happier patient. There are joint preserving surgeries. However, 70% of patients receive no special treatment and experience bone compressions, ultimately requiring them to undergo THA.

In an effort to produce a breakthrough, Dr. Kuroda has conducted extensive research on the "growth factors for regenerative medicine." Though he has performed this treatment with excellent results, the Pharmaceutical and Medical Device Act, or PMDA, poses many hurdles. This law governs the quality of medicine and medical equipment to ensure efficacy and safety. The end result is that this new type of treatment has not yet reached the patients in need.
That said, I have conducted stem cell therapy for patients with the disease and witnessed many instances where dead bone tissue fully recovers. Furthermore, we recently came to the realization that injecting a combination of cells and growth factors in the dead tissue produces a superior outcome. Under the Regenerative Medicine Act – the law that ensures the safety of regenerative treatment – we aim to combine the use of both growth factors and cells to provide distressed patients with a new solution as quickly as possible. However, a number of challenges remained:
1. There was no lead developer
2. Quality control of the cells from a medicinal perspective
3. Administration
With these challenges in mind, we have progressed our project.

We have conducted actual on-site clinical treatment. I should note that it is uncommon for a researcher and a clinician to join in developing treatments. This unusual pairing is actually the foundation of our success thus far. Ultimately, because our goal is to have the treatment covered under health insurance, we designated ourselves as the lead developers in this project. In terms of cell quality, my typical cell culture processes have yielded appropriate results for treatment. We plan first to use these cells. Furthermore, we have stabilized the combination of growth factors and cells at the time of injection, to create long-lasting effects. We have already applied for a patent for the device that injects the medicine precisely into the dead tissue. With this device, we can provide surgeries by cutting only about 1cm of skin. This procedure can be completed within a day and does not require hospitalization. All of which are remarkable benefits for the patient.

We have already completed the treatment technique. All that remains for us to begin treatment is a place to manufacture the medicine and hospitals to provide treatment. Once it becomes an all-inclusive package, we can create a system to provide this treatment on a continual basis, thus paving the way for a thriving business. And it is this side of the business that we are seeking a highly qualified individual to join our team. Currently, there are about 3,000 patients who suffer from ONFH. In America, there are about 20,000 individuals with the same disease. These may not seem like large numbers. However, several scientific papers cite the possibility of a massive surge in ONFH patients due to COVID-19. To save COVID-19 patients that experience severe pneumonia, doctors use considerable amounts of steroids. These steroids are a significant risk factor for developing ONFH, and thus the steroid treatments may result in a sudden increase in ONFH patients. If we refer at the example of SARS, simple calculation yields a 4.3% possibility that any given COVID patient develops ONFH.
Current estimates put the total number of COVID patients at 150 million. Within 5 years, this would equate to an additional *6.5 million* ONFH patients. Right now, we are in the phase prior to a surge of patients. That is why we believe it is imperative to develop and implement our project with immediate urgency. The total cost for our treatment is estimated to be 1 to 2 million yen, approximately 1/10th the cost of THA. If our treatment becomes standard procedure, we believe it will become the primary treatment method for the disease, thus creating more than ample opportunity for a business venture.

As a first step, we are preparing to begin treatment at Kyoto University Hospital, beginning in the first half of 2022. By 2023 we aim to have our treatment available overseas, and to become standard procedure.
Currently, it is only the two of us who are working on this project. In order to transform this project into a business, grow the business, and then provide treatments to patients worldwide, we must enlist the support of many others. We especially are asking for assistance in areas where we lack expertise - namely finance, marketing, and IP strategy.

In regards to funding, we have enough capital to commence treatment in Japan. However, to provide treatment globally, we must have multiple cell processing centers, which require additional funding. If you are interested in treating an intractable disease, developing a new treatment, and want to contribute to people's lives around the world, please join us! We welcome you with open arms.

[Q& A]
Q.
I have two questions. The first one is which therapy is better for commercialization, cell therapy or gross factor therapy? And the second question is, I recognize that this therapy is already enter into a pre-clinical trial stage and can you give us any a comment about the efficacy of the therapy?

A.
Can I answer the second question first? We already started, we can start the cell therapy. So we don't need so any research to start the cell therapy. And the first question. I think it is better to use both cell and growth factors because only if you want to use their only growth factors, you check the many debtors and the dispatches and that we can do the treatment in with the factory and cells the same time. So, you can start that immediately now.

Q.
I really interested in that technology itself. But in the presentation, you didn't mention that in detail, but what type of cell? For the pricing perspective, I strongly recommend to go to US first or as soon as possible, because you when you complete everything in Japan first and then your market will be limited, or the pricing will be very low. But as for the industry of the regional medicine, I strongly recommend to go to US first, as the comment.
A.
Thank you for your comment. So we are plan to use there's adipose derived stem cells now. But and so researching them more, so better, better cells. But the first I'll use there's people derived stem cells first. And so I hope to start in US I hope so.

Q.
Have you observed any side effects for your new solution? And also second question, Is your solution are clickable for all kinds of or FH caused by different reasons, or a different severe stage?
A.
The fewer side effects there so for pain and the stiffness or something like that, that not severe side effect in the in this treatment way.
Of course, so early stages is better to use these treatments because in the terminal stage still bone that compressed so it's hard to repair the compressed bone with this technique.