Special lecture

The 4th industrial revolution and its impact on medical fields

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Introduction

In January 2016, the word "4th Industrial Revolution", which became a big buzzword in the World Economic Forum and shook the world, is now deeply embedded in the life of Korea in May 2018 as a regular menu at the elementary school parents briefing session. The fourth industrial revolution is the emergence of the rapidly developing information and communication technology that accelerates the development of other science and technology, which will fuse manufacturing and service industries, create a boundary between the world of consumption and production. The Fourth Industrial Revolution is a concept that emphasizes the fusion of reality and virtual. In his book ,The Fourth Industrial Revolution, the advocate of the Fourth Industrial Revolution and the Chairman of the WEF, Klaus Schubert, in his book The Fourth Industrial Revolution, referred to the Fourth Industrial Revolution as "a fusion of the three fields of digital and bio- Technology is a technological revolution that dramatically changes the economic and social structure. He said ,"We are on the verge of a technological revolution that will fundamentally change the way we have lived and worked. The scale, scope and complexity of this change will be quite different from what humanity has experienced before."

The fourth industrial revolution has the characteristics of 'Hyper-Connected' and 'Hyper-Intelligent'. Through the Information and Communication Technologies (ICT) such as Internet of Objects (IoT) and Cloud, It is predicted that the objects, the human being and the objects will be interconnected and changed into a more intelligent society such as big data and artificial intelligence[1].

But there are important issue to understand all these stories. I am doubt whether there is a real fourth industrial revolution. Some are just marketing tools. However, it is hard to deny that the changes that are under way are innovative enough to be called the fourth industrial revolution. In a more accurate sense, I

tend to view the present as the point of digital transformation. In the following article, I will express the meaning of the 4th Industrial Revolution and digital transformation in the same meaning.

Digital transformation and Atopic Dermatitis

Atopic dermatitis is a chronic inflammatory skin disorder that accounts for up to 20% of children and a prevalence rate of 1-3% in adult atopic dermatitis. Because of the nature of the disease, it is a disease that repeatedly improves and aggravates, so maintenance and care are very important factors. Here is one patient. This patient has allergies to birch pollen, so if the pollen is released in late spring, the symptoms will worsen. We call this the flare up state. In this case, there is no problem if it is properly treated. However, if not properly treated, it will lead to an outbrake condition in which an infection such as Staphylococcus aureus and herpes is accompanied and a severe inflammatory reaction occurs. Healing begins once the root causes are identified and treated. During this stage the skin can become thickened, cracked. Dry, scaly and have red to brownish-gray patches, this slowly subsides and he skin improves over time. Clear skin is revealed once healing is complete. However, if someone dosen't find and treat the root they could have a flare up as soon as they have another trigger.

The ultimate goal in the treatment of atopic dermatitis is to keep the clean skin as long as possible in this treated condition. For this purpose, it is necessary to predict the flare up time or objectively measure the severity of the disease[2]. However, according to existing literature, in 91% of studies, the study relies on subjective symptoms and signs such as quality of life, itching, etc. and measures long term control of atopic dermatitis. Of course, in 27% of patients, regular use of drugs, ie, topical steroids, and in rare cases, the use of immunomodulators or the use of antibiotics and antihistamines may be checked, and at 25%, the number of times to first flare It is rarely measured by the length of time it takes for the flare to disappear, but most of the time depends on subjective symptoms and signs[3]. We need a validated methodology for measuring the severity of AD during maintenance therapy or predicting the time of flare up. So what indicator can be the candidate? For this, we want to check again for the etiology of atopic dermatitis. The pathogenesis of atopic dermatitis can be summarized as abnormal skin barrier function, excessive inflammation reaction, and itching caused by these. We focus on the abnormality of skin barrier function among them and want to find out the measurement method based on it. Skin barrier function can be measured by various methods. Among them, transepidermal water loss and skin conductivity can be used to measure skin barrier function as a non-invasive method. Along with its advantage as a non-invasive method, the clinical importance of TEWL and hydration also have been supported by the series of studies reporting the higher correlation between skin barrier functions and severity of atopic dermatitis. In addition to the potential application as a diagnostic tool, usage of TEWL as a prediction marker for atopic eczema has also been supported by the a few cohort studies. These results suggest that maintaining TEWL in a normal

range may be interpreted as keeping the skin barrier in a normal condition, and therapeutic efficacy of skin disease treatment can be evaluated by measuring the TEWL. The method of measuring TEWL is open chamber method used for Tewameter®, closed chamber method used for vapometer, and condenser chamber method used for aquaflux according to the measurement method. In order to measure TEWL, it is necessary to purchase three representative types of machines. Especially, in the case of open chamber method such as Tewameter®, in addition to the difficulty of such a measurement method, the most problematic thing is that there is a huge barrier to paying around 20 million won for a general patient to purchase it for use. The method of measuring TEWL can be classified by open chamber method used for Tewameter®, closed chamber method used for vapometer®, and condenser chamber method used for aquaflux®. In order to measure TEWL, it is necessary to purchase these representative types of machines. Especially, in the case of open chamber method such as Tewameter®, In addition to the difficulty of such a measurement method, the most problematic thing is that there is a huge barrier to paying around 20 million won for a general patient to purchase it for use. However, Korea is now living in the era of the fourth industrial revolution based on the development of sensor and IoT related business which is rapidly developing. As mentioned in the introduction, the most important part of the fourth industrial revolution is artificial intelligence and big data. Especially, the most important part in digital healthcare is digital transformation of life log. In this era, we can make the following hypothesis realistically by using a machine that can take TEWL with cheaper and faster time using latest technology rather than buying expensive Tewameter® or vapometer®. The most important principle for treating various chronic diseases and metabolic syndrome is habit change. For example, as mentioned in various papers, there is a paper that if we simply weigh every day, we can finally lose 5 kg of weight a year. The most important factor to effectively manage diabetes is the measurement of glucose using strips is essential. For proper management of atopic dermatitis, we will develop a device that can measure objective indicators every day and based on this, we will be able to manage the skin, use appropriate topical application, and if necessary, receive appropriate treatment. In conclusion, if IoT-based objective indicators for TEWL and skin hydration can be measured on a daily basis, it can be hypothesized that it is ideally able to be of help for improving the skin barrier function, and of therapeutic benefit for skin diseases, such as Atopic dermatitis. We developed the new device for barrier function daily based on IoT technology. The newly developed device was compared with the vapometer® of the same operating method, and after the validity test, the following clinical tests were conducted to prove the hypothesis. We analyzed the treatment of moderate atopic dermatitis patients for one month. The current SCORAD and skin barrier status were measured after analyzing the amount of moisturizer applied several times a day, how much topical steroid was applied, how much flare up was for one month, and how much of the systemic steroid was consumed in an extended period. At the same time, they taught me how to measure skin barriers using new devices and then educated them on a daily basis. Over the course of one month, they were given conventional moisturizers and prescription medicines and

recorded how they applied moisturizers and topical agents on a daily basis. After that, the treatment pattern during the month was compared with the treatment pattern during the previous month. This study demonstrates that this new device can easily measure the skin barrier function on a daily basis with the same performance as the existing equipment at low cost. This study is also the first to establish that daily measurements using an IoT-based skin barrier measurement device would prevent deterioration during atopic dermatitis treatment, reduce the use of steroids, and encourage the use of moisturizers. Before the lesion deteriorates, the device is used to recognize changes in the skin barrier function and immediately corrects with the moisturizer and nonsteroidal topical application. Through this study, we intend to open a new paradigm for the treatment of atopic dermatitis and to improve the efficiency of treatment by constructing predictive indices using artificial intelligence.

Design Thinking in 4th Industrial Revolution

Thus, the Fourth Industrial Revolution has a great influence on the treatment of allergic diseases such as atopic dermatitis. However, the most important thing is that we do not treat diseases called atopic dermatitis, but rather treat and manage patients with atopic dermatitis. Even if the medical person is in the era of the inhumane fourth industrial revolution, the mind to understand, educate, and treat the patient more basically becomes more important than anything else. Even in the era of the inhumane fourth industrial revolution, healthcare professionals have become more important than ever to understand, educate, and treat patients from the standpoint of the patient. It is a concept that has recently been under the limelight and it is a design thinking that can be applied to all the problems that can be attributed to the general healthcare system in general and not to the viewpoint of existing providers, Healthcare Service Design is a method to find a solution to solve. The Human understanding design center of the Seoul Medical Center and the Atopy and Asthma Educational Information Center of the Seoul Metropolitan City have used these methods to create educational materials that focus on AD patients' experiences. One example is video production that can effectively educate patients and caregivers on wet wrap dressing methods that can be practiced when patients with acute dermatitis suddenly become ill. We reanalyzed the education materials of atopic dermatitis including education contents based on the consultation contents of the past eight years and searched and rearranged the missing parts to make a cardboard type teaching material. It is a system in which a parent or guardian displays the necessary information in a checklist and concentrates on the card based on the information that the child intends to learn. The name of this material is "pick me up card".

Conclusion

The Fourth Industrial Revolution does not depend entirely on machines and computers, but ultimately it

has the ultimate goal of improving human well-being and quality of life. Therefore, it is also important to understand the state-of-the-art technologies in these times, but it is important to keep in mind that the application of all these technologies will center on human experience and patient experience.

References

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