Pisco Med Publishing

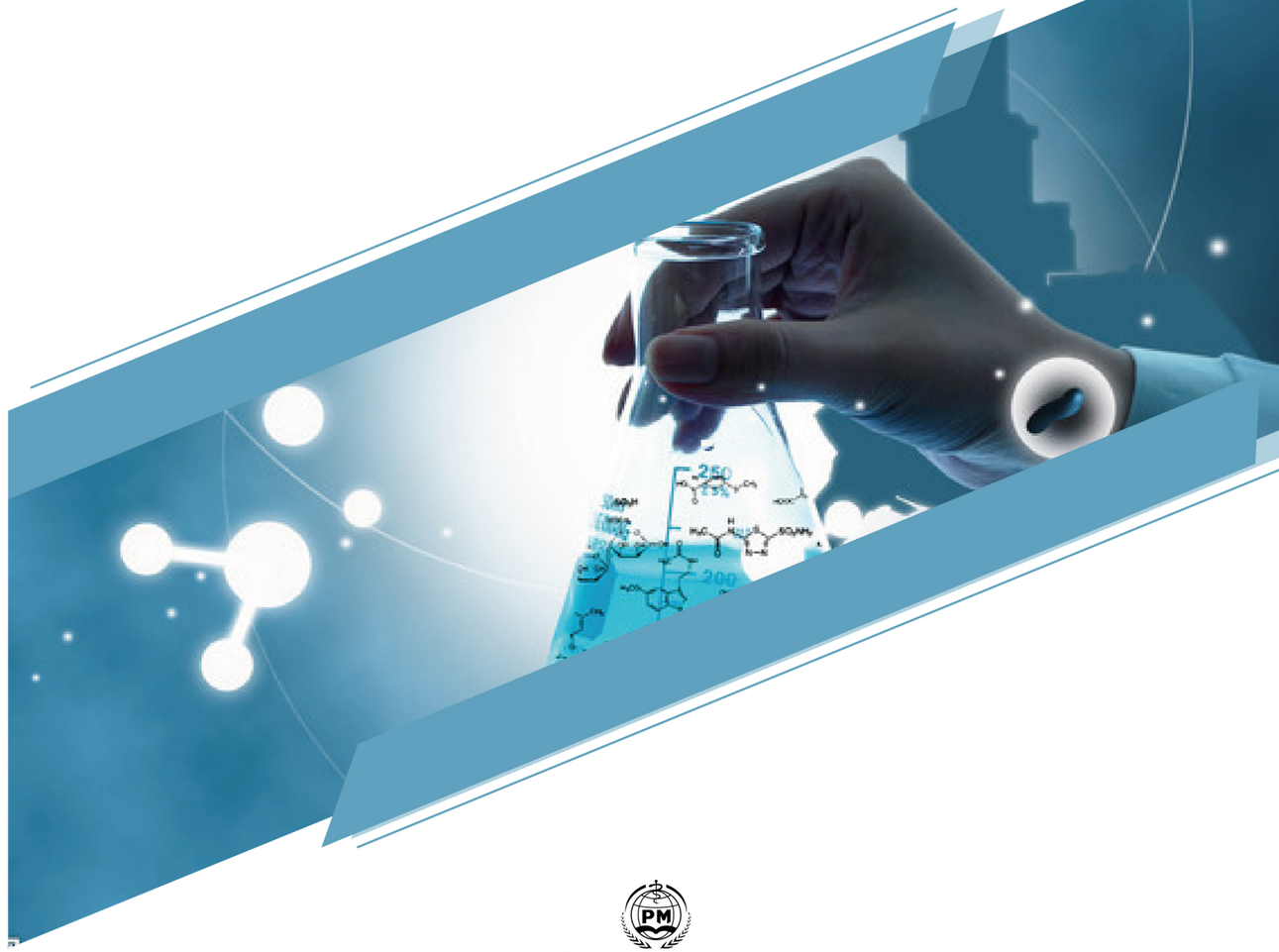
PiscoMed Publishing Pte. Ltd.
Address: *73 Upper Paya Lebar Road #07-02B-11*
Centro Bianco Singapore 534818
Website: *www.piscomed.com*
E-mail: *contact@piscomed.com*

ISSN 2251-2632

2022 VOLUME 11 ISSUE 1
ISSN: 2251-2632

1

Preventive Medicine Research



Pisco Med Publishing

Editorial Board

Editorial Board Member

Volume 11 Issue 1·2022
ISSN: 2251-2632

Preventive Medicine Research

Pisco Med Publishing

Pisco Med Publishing

2022 | Volume 11 | Issue 1

Preventive Medicine Research

http://ojs.piscomed.com/index.php/PMR

Contents

Original Articles

Pisco Med Publishing

Effect of Individualized and Standardized Vestibular Rehabilitation Strategy in Peripheral Vertigo

Yue Liu, Peng Tang* **Corresponding author: Peng Tang**

The third department of Neurology, the Shaanxi Provincial People's Hospital, Xian 710068, China.

Abstract: Objective: To explore and study the effect of individualized and standardized vestibular rehabilitation strategy in peripheral vertigo. Methods: 120 patients with peripheral vertigo in Shaanxi Provincial People's Hospital were analyzed. The 120 patients can be randomly divided into training group and control group, with 60 patients in each group. The treatment methods used in the control group included Hemorheology treatment, ion channel blocking treatment, dehydration treatment, antioxidant treatment, anti-virus treatment, etc. after treatment, no rehabilitation training measures were taken. On the basis of the treatment method of the control group, the training group carried out rehabilitation training according to the actual condition of the patients. The recurrence and improvement of vertigo symptoms of the two groups were compared, and the UCLA vertigo score and Berg Balance Scale score were analyzed. Results: after vestibular rehabilitation, the UCLA vertigo score of the training group was significantly lower than that of the control group ($P < 0.05$); After 4 weeks of vestibular rehabilitation training in the training group, the vertigo symptoms of the patients were significantly relieved. Compared with the control group, the difference was statistically significant ($P < 0.05$); Compared the BBS scores of the two groups, the training group was higher than the control group, the difference was statistically significant ($P < 0.05$); There were 7 cases of recurrence in the training group and 7 cases in the control group during the follow-up period. The difference was statistically significant ($P < 0.05$). Conclusion: individualized and standardized vestibular rehabilitation strategy for patients with peripheral vertigo can effectively reduce the course of disease, improve the cure efficiency, have significant therapeutic effect, and can be widely promoted and applied.

Keywords: Vestibular Rehabilitation; Peripheral Vertigo; Application Effect

Introduction

Vertigo is a kind of spatial illusion of human body, which produces an illusion that does not exist. Peripheral vertigo is a symptom that many patients are prone to. Some symptoms such as dizziness, migraine and sudden deafness often occur, which will directly lead to the gradual reduction of vestibular function until it disappears. Some patients will have the symptoms of recurrent dizziness, unstable posture, blocked walking, nausea and vomiting, which will directly cause the patients' physical discomfort and burden their lives. In this study, 60 patients in the training group were treated with personalized and standardized vestibular rehabilitation training according to the actual situation of the patients on the basis of clinical treatment methods, and good treatment results have been achieved.

1. Materials and methods

1.1 General information

120 patients with peripheral vertigo in the surgery department of Shaanxi Provincial People's hospital were taken as the research objects. These patients were randomly divided into the training group and the control group according to the ratio of 1:1. In the control group, there were 21 males and 39 females, aged 20-59 years, with a duration of 5 months to 22 years. In the training group, there were 23 males and 37 females, aged 21-60 years, with a duration of 7 months to 23 years, The data of the two groups were not statistically significant, and had strong comparability.

1.2 Inclusion criteria

Each patient in the training group voluntarily received vestibular rehabilitation treatment, and all patients had no communication disorder, mental retardation or visual impairment.

1.3 Exclusion criteria

Patients with malignant tumor, weak system, uncomfortable symptoms during training, and unable to adhere to the whole process of rehabilitation training shall be excluded.

1.4 Treatment methods

The patients in the control group were treated with Hemorheology therapy, blocking ion channel therapy, dehydration therapy, oxidant therapy, antiviral therapy, hyperbaric oxygen therapy, etc. instead of vestibular rehabilitation training. During the treatment of patients in the training group, personalized and standardized vestibular rehabilitation training and treatment methods should be adopted according to the situation of each patient, and special nurses should accompany and guide the patients. According to the vestibular rehabilitation theory, the vestibular rehabilitation training strategies are formulated, mainly including: ① vestibular adaptive training, patients' gaze when turning their heads, horizontal turning head movement, head vertical movement, oblique vertical movement, head circle movement, visual target training, saccade training, visual tracking training, etc; ② Static balance training, Romberg static standing exercise, enhanced Romberg static standing exercise, toe heel standing exercise; ③ Dynamic balance training, ankle swing exercise, ball throwing exercise, circular swing, walking exercise. Benign positional vertigo training, Brandt daroff training, Semont method training, Epley method training, horizontal rolling method training; Alternative training, functional activity training, etc.

1.5 Evaluation index

Compare the vertigo condition, degree of vertigo and the impact of vertigo on quality of life before and after treatment. Score the vertigo questionnaire. The higher the score, the more serious the condition is. After treatment, the lower the score, the better the treatment effect. Grade the recurrence rate of patients within 6 months after treatment. Carry out rehabilitation training for the patients for 4 weeks, and record Berg Balance score every week. The patients should be required to complete the training within the specified time, including sitting, standing, rotating, single foot standing switching, single leg standing, bending over to pick up objects, arm straightening, original turning, turning back, alternating feet on the bench and other actions. The score of each activity item is set to 0-4 points, and the action that cannot be completed is 0 point, The score of normal completion is 4 points. The higher the score the patient gets, the better the balance is.

1.6 Statistical methods

SPSS13.0 statistical software is used for calculation to realize the analysis of data, and "$x \pm s$" is used for data measurement. T is used for test between the two groups, and examples are used for counting $\chi 2$. Compare the rate (%) between data groups.

2. Results

2.1 UCLA vertigo score comparison

There was no significant difference in UCLA vertigo score between the two groups before treatment; The UCLA vertigo score of the two groups after treatment was significantly lower than that before treatment ($P < 0.05$); After treatment, the UCLA vertigo score of the training group was significantly lower than that of the control group ($P < 0.05$).

2.2 Comparison of vertigo symptoms and improvement between the two groups

After 4 weeks of vestibular rehabilitation training, the vertigo symptoms of the patients in the training group had been completely improved, and the improvement was significantly higher than that of the control group ($P < 0.05$).

2.3 Comparison of BBS scores between the two groups

After 4 weeks of vestibular rehabilitation training, the BBS score of the patients in the training group was significantly higher than that before training, and the BBS score of the training group was significantly higher than that of the control group ($P < 0.05$).

2.4 Comparison of recurrence rate between the two groups

During the follow-up of the control group, 7 patients had recurrence, and the recurrence rate was 12.13%. There was no recurrence in the training group. There was significant difference in the recurrence rate between the two groups（ $\chi 2 =7.652$， $P<0.05$).

3. Discussion

Vestibular rehabilitation training for patients with peripheral vertigo can effectively alleviate their vertigo,Reduce the symptoms of patients and improve their quality of life. The eyes can be used to better observe the surrounding things and feel the beauty of life. The vision can feel the surrounding things. The body can adjust its movement and posture. The vestibule can determine the direction and speed of the body. Among them, the vestibule is very important. The balance of the human body is directly related to the running state of the vestibular function. In the process of vestibular rehabilitation training, the principle of vestibular reflex should be combined. The vestibular system has good adaptability and plasticity. The training and improvement of vestibular function can improve the functions of patients' vestibular system. This training belongs to physical therapy, which requires professional medical staff to carry out regular and scientific training on the patient's head, neck and body, so as to realize the continuous enhancement of vestibular metabolism. While effectively alleviating dizziness, the brain is also restored to a balanced state. Medical staff can conduct some movement training for patients that are easy to induce dizziness symptoms, so as to promote the improvement of vestibular metabolism. This training method is also suitable for patients whose condition is in a stable period and who have symptoms such as imbalance.

Conclusion

When carrying out individualized and standardized vestibular rehabilitation training for patients with peripheral vertigo, we should pay attention to the protection of patients, avoid their falling, always pay attention to their spirit, psychology and emotion, reasonably guide and overcome their depression, anxiety, anxiety and panic, pay attention to the psychological comfort of patients, and create a comfortable, good and loose treatment environment for patients, Help the patient adapt to the training process. After this training, the comparative study showed that for the training group, after vestibular rehabilitation training, the dizziness of patients was significantly lower than that of the control group, the difference was statistically significant ($P < 0.05$); For the patients in the training group, after 4 weeks of training, the vertigo symptoms were significantly improved ($P < 0.05$); During the 6 months of follow-up, there was no relapse in the training group and 6 relapses in the control group. The difference was statistically significant ($P < 0.05$). The standardized and personalized vestibular rehabilitation training method can significantly shorten the course of peripheral vertigo, improve the cure efficiency and treatment effect. The training process is relatively safe, and it is worthy of extensive application and promotion.

References

[1] Lin, CJ, Xi, SX, Wang, J, Effect of vestibular rehabilitation training on improvement of vertigo disability symptoms in patients with vestibular peripheral vertigo [J], Chinese Journal of medicine 2020 (32).

[2] Huang, XB, Liu, B, Chen, XW, Duan, JP, Zhao, XY, Study on balance function of patients with peripheral vertigo[J], Chinese Otorhinolaryngology Head and neck surgery, 2009 (08).

[3] Cui, QJ, Wang, R, Yan, J, Liu, F, Chen, N, Zhang, L, Dai, F, Lou, Y, Short term effect of vestibular rehabilitation on patients with vestibular peripheral vertigo and its influencing factors [J], Journal of Clinical Otorhinolaryngology Head and neck surgery, 2022 (03).

[4] Zhang, JW, Xu, J, Ni, Z, Han, L, Yang, L, Zhang, QC, Luo, Y, Study on the characteristics of semicircular canal frequency injury in 73 patients with anterior peripheral vertigo [J], Chinese Journal of otology, 2019 (06).

[5] Huang, XB, Liu, B, Li, XP, Zhou, YS, Similarities and differences of sensory structure between patients with type 2 diabetes and peripheral vertigo [J], Journal of Clinical Otorhinolaryngology, Head and neck surgery, 2021 (07).

[6] Xie Y. Analysis of clinical treatment of peripheral vertigo combined with anxiety and depression[J]. Chinese and Foreign Health Digest, 2012(32):147-148. DOI:10.3969/j.issn.1672-5085.2012.32.137.

Pisco Med Publishing

Covid-19 Diagnosis Based on CT Images Through Deep Learning and Data Augmentation

Ruiwen Hu[1]*, Tianrun Wang[2], Yaxing Jing[1], Tangyu Xu[3], Feiyu Chen[2]

1. Huazhong University of Science and Technology, Wuhan 430074, China.

2. Xiamen University, Xiamen 361005, China.

3. Soochow University, Suzhou 215026, China.

Abstract: Coronavirus disease 2019(Covid-19) has made people around the world suffer. And there are many researchers make efforts on deep learning methods based on CT imgaes, but the limitation of this work is the lackage of the dataset, which is not easy to obtain. In this study, we try to use data augmentation to compensate this weakness. In the first part, we use traditional DenseNet-169, and the result shows that data augmentation can help improve the calculating speed and the accuracy. In the second part, we combine Self-trans and DenseNet-169, and the result shows that when doing data augmentation, many model performance metrics have been improved. In the third part, we use UNet++, which reaches accuracy of 0.8645. Apart from this, we think GAN and CNN may also make difference.

Keywords*:* Covid-19; DenseNet-169; Data Augmentation; CT Images

1. Introduction

The outbreak of covid-19 is a big challenge for the whole world. It has infected more than 240 million individuals and cause almost 5 million deaths. Nowadays, the most popular way to detect covid-19 is nucleic acid testing，but it needs about 3-6 hours and costs tons of money. So people are seeking for ways to diagnose covid-19 efficiently for some clinical resource limited areas, etc. Deep learning has made a lot of extraordinary results these years and has been proved that is a good way to help detect potential patients when the result of nucleic acid testing has not come out. In the field of deep learning, Convolutional Neural Network makes a big difference in image classification. After the groundbreaking work of AlexNet[1], we have witnessed many milestones that CNN achieved. With GPU, it's possible to train a CNN model very fast and with great accuracy. When training a CNN model, the model can probably be overfitted if the dataset is too small[2]. To overcome this obstacle, data augmentation is an efficient way. In our study, we use CT images of lung as our dataset and DenseNet-168[3] as our model. We also use horizontal flipped, vertical flipped and diagonal flipped for data augmentation. And also we train UNet++ to do segmentation to detect focus of infection.

2. Literature review

Recently, artificial intelligence has been widely studied and used in medical field, like diagnosing diseases, surgical robot, virtual nursing. Inside, there are various DL framework like RNNs, AEs, GANs. One of the hottest research topics is about COVID-19. A mass of essays have been published during this epidemic, which fall into three categories: detection of COVID-19, severity assessment and infection segmentation. In this paper we will discuss the study of the COVID-19 binary classification issue using CT images.

When searching for information and technology of detecting COVID-19, we find that an army of paper with keywords of "detecting COVID-19 with CT scans" and "machine learning with covid-19 diagnosis". In their work, the majority of them used machine learning technology and deep learning or convolution neural network (CNN), which truly attained certain results. Typically, Ardakani [4] gave a detailed view of ten representative CNNs with comparing their performances in

detection of COVID-19 : VGG-16, GoogleNet, ResNet-18, Xception, ResNet-101, AlexNet, MobileNet-V2 and so on. Among them, Xception and ResNet-101both reached effective results- an AUC of 0.994, which is better than the radiologist's AUC of 0.873.

Nevertheless, a large quantity of data is needed in deep learning methodology which is impossible to gain right now. The limited and unbalance data influence the performance of deep learning hugely, so many first-class scientists and doctors are trying to figure out this drawn backs-limited above. Currently, for refining the diagnose accuracy, there are lots of ways to be explored.

Firstly, using data augmentation technique, like affine transformation (rotation, translation, scaling, reflection, shearing), image mirroring. Recently Li et al. [5] reduce data scarcity by decomposing the 3D CT scan into multi-view slices as input data and integrate prior domain learning into their model. In the end, they achieved an obviously improved accuracy from 0.867 to 0.966. Zhou [6] combined several 2D models and Taylor et al. [7] utilized photometric and geometric to deal with the data-scarcity issue to enhance the effect of the model. Sameena et al. [8] used AdaBoost of decision stump trees to diminish the degree of overfitting and generalization and achieved an accuracy of 0.96, whose classifier is dynamically chosen depend on test sample' s characteristics. Kamrul et al.[9] proposed a 3D-CNN structure, which is integrated with segmentation, class-rebalancing, progressive resizing, augmentation and can expand training data through being trained on the 3D-CT patches to study the inter- and intra-slice spatial voxel information. Ozturk et al.[10] two-stage data enhancement approaches- a shallow image augmentation and the Synthetic minority over-sampling technique algorithm to solve the deficient and unbalanced data problem, which contributes to next to 10% performance.

In addition to the data, the suitable hyperparameter is also vital to determine the classification performance. Sameena et al. [8] used WOA-BAT optimization to choose hyperparameters of CNN and proved that using WOA-BAT optimized CNN performed superior to the standard CNN architecture. Priya et al.[11] offered a SqueezeNet structure network based ResNet-50, which is used for lung infection segmentation of CT and can be automatically optimized.

Transfer learning also has a satisfying performance in detecting COVID-19, which can reduce the dependence on data while achieving better accuracy. A sort model to diagnose COVID-19 is proposed by Ilyas LAHSAINI et al. [12] based on deep transfer learning and the DenseNet-201 architecture with 0.988 of accuracy. Tuan D Pham [13] has conducted a comprehensive study on the use of pre-trained CNNs for COVID-19 diagnosed. He investigated 16 pre-trained CNNs and concluded that CNNs can performed well after using several epochs training and DenseNet-201 did the best work, which can reach the highest average specificity of 0.9667. Additionally, he proved the transfer learning with using image slices not data augmentation can do better classification. Contrastive self-supervised learning and transfer learning are combined and utilized by He et al.[14] to study unbiased and useful feature representations and this framework achieved an AUC of 0.94 under limited training CTs. Maghdid et al.[15] created an image dataset containing a mass of CT and X-ray images and utilizede a pre-trained AlexNet structure on the dataset based on transfer learning and deep learning, resulting accuracy up to 0.98.

There is one more point that design fresh neural network framework. A sequence of new-style neural networks is being proposed all the time. Hong et al.[16] put forward a lightweight convolutional neural network model derived from the attention mechanism and depth-wise separable convolutions named MGMADS-CNN, which achieved accuracy of 0.9825 on CT images. M.Polsinelli et al.[17] presented a light oriented capsule network derived from the SqueezeNet and achieved 0.830 of accuracy. The light of it is to achieve a satisfying result on medium power computers, alleviate the requirement for hardware. Hu et al.[18] put forward one kind of new weakly supervised deep learning structure instead of commonly used supervised learning framework to learning from image-level label, which can reduce the dependence of manual labelling of images

Another important way is to combine several models to make diagnose. Rohit et al.[19] raised a method of integrating four pre-trained models with Sugeno fuzzy integral and achieving 98.93% accuracy. Sameena et al.[18] built their architecture by utilizing features selected from five CNN architectures. Ardakani et al.[20] nurtured twenty radiological features extracted using CT scans into five classifiers to develop the best CAD system performing in COVID-19 diagnose, which has an AUC of 0.965.

In addition to the above methods, there are still many other ones, like the “deep domain adaptation “which is used to deal with the shortage of labeled data, removing images from the majority classed to down sample.

In conclusion, they explored and optimized each process of deep learning classification by proposing new ways of their own. One same limitation of the majority studies is that their models’ performances don’t be compared with radiologists. It will be a better framework by combination of methods.

3. Research methods

This study, we used the dataset collected by[14], which reported the biggest public dataset so far of CT images for detection of Covid-19. As for the model, we chose DenseNet-169 as it has the best accuracy in the same article above. We also used Self-trans[14] like what they do because in their article, it’s proved that this is a practical way to improve the accuracy. And data augmentation is what our work wants to research if it is useful for improve the efficiency of our model.

3.1 DenseNet-169

We use pre-trained DenseNet-169 model as our model and Stochastic Gradient Descent (SGD) as our optimizer. DenseNet-169 is one of the DenseNet models families, which are designed to work image classification. There is a parameter **k** , called growth rate, which refers to the number of extra channels in each layer, or the convolution kernel of each layer. If the channel of the input feature graph is **K**, then the channel number of the **L** layer is **K+(L-1)k**, because each layer accepts the characteristic graphs of all the previous layers, so this **k** can be very small, usually 12 will have a good result. We should note that the actual meaning of this **k** is the newly extracted features. There are 1 x 1 bottleneck layers applied before each 3 x 3 convolution layer followed by transition layer. Diverse kind of Dense-Net has different **k**. So they have unequable sizes and accuracies .This is the main difference.

DenseNet exploit the potential of the network through feature re-use[1].This means that every layer can re-use the features produced by all previous layers. By doing so, it can deal with the degradation problem and vanishing gradient. DenseNet can be said to be an implicit strong supervision mode, because each layer establishes a connection with the previous layer, and the error signal can be effortlessly propagated to the former layer, so the earlier layer can obtain direct supervision from the last classification layer. At the same time, it has the characteristics of fewer parameters and higher computational efficiency. Besides, in DenseNet, it uses different levels of features, and it tends to give smoother decision boundaries. This also explains why DenseNet still performs well when training data is insufficient.

3.2 Self-trans + DenseNet-169

Transfer learning is a ideal way to mitigate data deficiency, which can use data rich source tasks to help learn target tasks with insufficient data through previously extracting useful features on big datasets and then finetuning the wights on the inefficient datasets. But there are some problems like the discrepancy in visual appearance and class labels between source data and target data, the over-parameterized pre-trained network.

For the sake of these problems, we integrate it with self-supervised learning(SSL), which is usually utilized to learn general representations without considering labels. But this time it is used to learn unbiased and powerful features without human annotations, which can get some intrinsic features and characteristics of the dataset. In other words, SSL is only based on data itself to learn meaningful results and satisfying performance. In this study, we construct some auxiliary tasks to provide self-supervision for the transfer learning process.

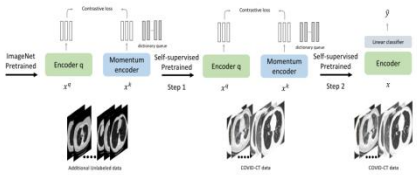


Figure 1 structure of Self-trans + DenseNet-169[31].

3.3 UNet++

3.3.1 Introduction to UNet++

UNet is a deep learning network using coder and encoder, which is widely used in medcal images segmentation problems.

To avoid the fusion of semantically dissimilar features of pure jump connections in UNet, UNet++ further strengthens th ese connections by introducing nested and dense jump connections, in order to reduce the semantics between encoder and dec oder.

3.3.2 Our network Structure

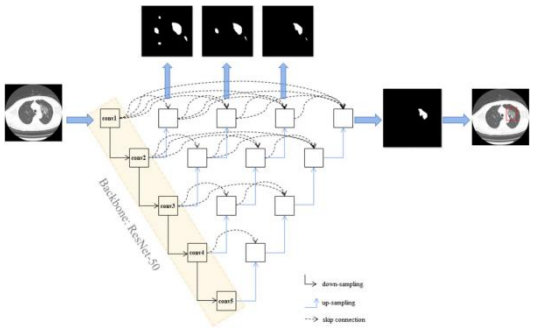


Figure 2 structure of our network

3.4 Data Augmentation

When the dataset is too small, it is likely that the model is overfitting. And data augmentation is a good way to solve this problem, because it helps the model extract more features from those images. We use horizontal flipped, vertical flipped and diagonal flipped as our methods to make the dataset larger. These ways do not change the nature of those CT images so the produced images share the same label with the original ones. We set 3 degrees as the flipped angle after lots of experiments that set different angles.

4. Result

4.1 DenseNet-169

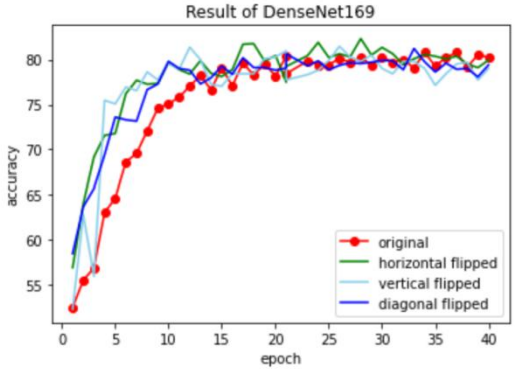


Figure 3 the result of DenseNet-169

The graph shows that data augmentation can improve before 15th epoch but its improvement is not evident after 15th epoch.

4.2 Self-trans+DenseNet-169

$$precision = \frac{TP}{TP + FP}$$

$$recall = \frac{TP}{TP + FN}$$

$$F1\ score = \frac{2 * precision * recall}{precision + recall}$$

We train the model with 200 epochs of train and 1 epoch of prediction. And the result is in TABLE 1. From the Table we can see that data augmentation did make a difference on improving the result, but not all data augmentation methods work. Self-trans+Horizontal flipped or Vertical flipped can improve the F1 score and accuracy apparently, but Self-trans + Diagonal flipped do not have an apparent effect, and the mix of 3 data augmentation methods make the result even worse than original results.

Table 1 The results after training the model with 200 epochs of train and 1 epoch of prediction.

	TP	TN	FN	FP	TP+FP
DenseNet-169 + self-trans	99	50	6	48	147
DenseNet-169 +self-trans + horizontal flipped	88	73	17	25	113
DenseNet-169 + self-trans+ vertical flipped	90	73	15	25	115
DenseNet-169 + self-trans+ diagonal flipped	72	85	33	13	85
DenseNet-169 + self-trans+ horizontal flipped + vertical fllipes + diagonal	82	61	23	37	119
	precision	recall	F1	acc	AUC
DenseNet-169 + self-trans	0.67	0.94	0.79	0.73	0.88
DenseNet-169 +self-trans + horizontal flipped	0.78	0.84	0.81	0.79	0.88
DenseNet-169 + self-trans+ vertical flipped	0.78	0.86	0.81	0.80	0.88
DenseNet-169 + self-trans+ diagonal flipped	0.84	0.69	0.76	0.77	0.87
DenseNet-169 + self-trans+ horizontal flipped + vertical fllipes + diagonal flipped	0.69	0.78	0.73	0.70	0.81

5. Discussion and conclusion

In our study, we chose DenseNet-169 as our model and used several data augmentation approaches to improve the accuracy of model. In the first experiment, the number of covid and noncovid images in training set are 234 and 191 respectively. Then we doubled the training set by using each of the 3 augmentation methods to produce one more image for each of the origin image in second, third and fourth experiment respectively. In the fifth experiment, we used all methods for origin images and enlarge the training set by 3 times. We also used self-trans to improve accuracy because this is a method that has been proved practical [19]. And we calculate the F1 score, test accuracy and AUC in each experiment.

As the results show, with F1 score and AUC almost the same, the test accuracy of second to fourth experiments are all 4% - 7% better compared with the benchmark accuracy, which means the accuracy became better when we only use one of the three methods of data augmentation. However, if we use all of these 3 methods in one (the fifth) experiment, all 3 measuring parameters became worse. This might because we use the same learning rate (0.001) in all 5 experiments, and it might be too large for the fifth experiment, the dataset in which is much bigger than the others. We noticed that during the training process in the fifth experiment, the train loss become oscillated after 7-8 epochs. According to previous articles [22], this is a sign of setting the learning rate too large.

The work published in [21] also used DenseNet-169 with self-trans and get an accuracy of 83% with the same dataset, which is 10% better than our first experiment (also used DenseNet-169 + self-trans), though their AUC and F1 score is almost the same as ours. We consider that one probable reason is that, according to the paper, they used unlabeled images from Lung Nodule Analysis (LUNA) for self-supervised learning, a learning form between supervised and unsupervised learning. However, we didn't do this due to the time limit.

One of the benefits of self-supervised learning is that it can solve the overfitting problem very well [23], which is also an advantage of data augmentation [24]. But our best accuracy, which was got in third experiment, is 3% worse than theirs, though we our AUC is slightly better and we share the same F1 score. To improve our result, utilizing more data augmentation methods is a potential way. We only used horizontal flipped, vertical flipped and diagonal flipped, which are some basic ways for data augmentation. In Pham's paper[25], some other methods, such as reflection, horizontal translation, vertical translation, horizontal scaling and vertical scaling are also worth trying. And for those flipping method, it's a time-consuming work to test the best flip angle. If the angle is too small, than the produced images will be too similar to the origin images, which is not good for model to extract more features. If the angle is too big, than some part of lung shadow will fade out from the produced image. We tried several angles range from 1 to 5 with horizontal flipped as the data augmentation method and the result is almost the same. Furthermore, we have also thought of using GAN[26] for data augmentation, but GAN may change the nature of images, so we are not able to know the label of generated images, which was the problem that prevented us from using GAN to enlarge our dataset.

When it comes to the model we used, we chose DenseNet-169[27] because this net has the best accuracy according to[21]. Apart from this, we also used swin transformer[28] and unet++[29] with a new data augmentation method, mixup[30], and got very good results, with the accuracy of 84% and 86.5% respectively. However, it took too much time for us to write and tune these 2 nets and so far we have not known the F1 score and AUC of these 2 nets. In future work, we will continue working on complete the test results.

For the hyperparameters in DenseNet-169, we tried to modify some of those in[21] but didn't have good results. For instance, the images are resized to 224*224 originally, we tried some other scale, like 300*300 but the result is even worse. Therefore, we used hyperparameters the same as orinal ones. And for the function transforms.Normalize we used ((0.485, 0.456, 0.406), (0.229, 0.224, 0.225)), which is calculated by the mean and standard deviation of images in ImageNet. According to an answer in Stackoverflow, if images are special, like medical images such as CT or CXR images, than it's recommended to calculate the mean and standard deviation of images in our dataset to normalize our dataset better. This is also a time-consuming work and we don't have enough time to do this. We consider doing this will probably improve our test results. What's more, we tested both SGD and Adam as our optimizer, with learning rate=0.001, momentum = 0.9 for SGD

and learning rate = 0.001 for Adam. The results are almost the same. But we consider using a lower learning rate, especially for the fifth experiment as mentioned above.

References

[1] Technicolor, T. , Related, S. , Technicolor, T. , & Related, S.. ImageNet Classification with Deep Convolutional Neural Networks [50].

[2] Shorten, C., & Khoshgoftaar, T. M.. (2019). A survey on image data augmentation for deep learning. Journal of Big Data, 6(1).

[3] Iandola, F., Moskewicz, M., Karayev, S., Girshick, R., & Keutzer, K.. (2014). Densenet: implementing efficient convnet descriptor pyramids. Eprint Arxiv.

[4] Ardakani, A. A., Kanafi, A. R., Acharya, U. R., Khadem, N., & Mohammadi, A.. (2020). Application of deep learning technique to manage covid-19 in routine clinical practice using ct images: results of 10 convolutional neural networks. Computers in Biology and Medicine, 121.

[5] Li, Z., Zhao, S., Chen, Y., Luo, F., Kang, Z., Cai, S., ... & Li, Y. (2021). A deep-learning-based framework for severity assessment of COVID-19 with CT images. Expert Systems with Applications, 185, 115616.

[6] Zhou, L., Li, Z., Zhou, J., Li, H., & Gao, X.. (2020). A rapid, accurate and machine-agnostic segmentation and quantification method for ct-based covid-19 diagnosis. IEEE Transactions on Medical Imaging, 39(8), 2638–2652.

[7] Taylor, L., & Nitschke, G. (2018). Improving Deep Learning with Generic Data Augmentation. In 2018 IEEE Symposium Series on Computational Intelligence (SSCI) (pp. 1542–1547).

[8] Sameena Pathan, P.C. Siddalingaswamy, Preetham Kumar, Manohara Pai M M, Tanweer Ali, U. Rajendra Acharya, Novel ensemble of optimized CNN and dynamic selection techniques for accurate Covid-19 screening using chest CT images, Computers in Biology and Medicine, Volume 137,2021,104835, ISSN 0010-4825.

[9] Md. Kamrul Hasan, Md. Tasnim Jawad, Kazi Nasim Imtiaz Hasan, Sajal Basak Partha, Md. Masum Al Masba, Shumit Saha, Mohammad Ali Moni, COVID-19 identification from volumetric chest CT scans using a progressively resized 3D-CNN incorporating segmentation, augmentation, and class-rebalancing, Informatics in Medicine Unlocked, Volume 26,2021,100709.

[10] Ş. Öztürk, U. Özkaya, M. Barstuğan Classification of Coronavirus (COVID‐19) from X‐ray and CT images using shrunken features Int. J. Imag. Syst. Technol., 31 (2021), pp. 5-15.

[11] C. Priya, S.M.H. Sithi Shameem Fathima, N. Kirubanandasarathy, A. Valanarasid, M.H. Safana Begam, N. Aiswarya, Automatic optimized CNN based COVID-19 lung infection segmentation from CT image, Materials Today: Proceedings,2021.

[12] Ilyas LAHSAINI, Mostafa EL HABIB DAHO, Mohamed Amine CHIKH, Deep transfer learning based classification model for covid-19 using chest CT-scans, Pattern Recognition Letters, Volume 152,2021, Pages 122-128, ISSN 0167-8655.

[13] Pham TD. A comprehensive study on classification of COVID-19 on computed tomography with pretrained convolutional neural networks. Sci Rep. 2020 Oct 9;10(1):16942.

[14] He, XH., Yang, XY., Zhang, SH., Zhao, JY., Zhang, YC., Xing, E., Xie, PT., Sample-Efficient Deep Learning for COVID-19 Diagnosis Based on CT ScansmedRxiv 2020.04.13.20063941.

[15] Halgurd S. Maghdid, Aras T. Asaad, Kayhan Zrar Ghafoor, Ali Safaa Sadiq, Seyedali Mirjalili, and Muhammad Khurram Khan "Diagnosing COVID-19 pneumonia from x-ray and CT images using deep learning and transfer learning algorithms", Proc. SPIE 11734, Multimodal Image Exploitation and Learning 2021, 117340E (12 April 2021).

[16] Hong, G., Chen, X., Chen, J. et al. A multi-scale gated multi-head attention depth-wise separable CNN model for recognizing COVID-19. Sci Rep 11, 18048 (2021).

[17] M. Polsinelli, L. Cinque, G. Placidi A Light CNN for Detecting COVID-19 from CT Scans of the Chest arXiv preprint arXiv:2004.12837 (2020).

[18] S. Hu et al., "Weakly Supervised Deep Learning for COVID-19 Infection Detection and Classification From CT

Images," in IEEE Access, vol. 8, pp. 118869-118883, 2020.
[19] Rohit Kundu, Pawan Kumar Singh, Seyedali Mirjalili, Ram Sarkar, COVID-19 detection from lung CT-Scans using a fuzzy integral-based CNN ensemble, Computers in Biology and Medicine, Volume 138, 2021, 104895.
[20] A.A. Ardakani, U.R. Acharya, S. Habibollahi, A. Mohammadi COVIDiag: a clinical CAD system to diagnose COVID-19 pneumonia based on CT findings Eur. Radiol., 31 (1) (2021), pp. 121-130
[21] He, XH., et al. "Sample-efficient deep learning for COVID-19 diagnosis based on CT scans." medrxiv (2020).
[22] Jason Brownlee. “How to Configure the Learning Rate When Training Deep Learning Neural Networks”.
[23] Yan, W., “A Summary of Semi Supervised Learning”.
[24] Shorten, C., Khoshgoftaar, T.M. A survey on Image Data Augmentation for Deep Learning. J Big Data 6, 60 (2019).
[25] Pham, T.D. “A comprehensive study on classification of COVID-19 on computed tomography with pretrained convolutional neural networks”. Sci Rep 10, 16942 (2020).
[26] Goodfellow, Ian, et al. "Generative adversarial nets." Advances in neural information processing systems 27 (2014).
[27] Iandola, F., et al. "Densenet: Implementing efficient convnet descriptor pyramids." arXiv preprint arXiv:1404.1869 (2014).
[28] Liu, Z., et al. "Swin transformer: Hierarchical vision transformer using shifted windows." arXiv preprint arXiv:2103.14030 (2021).
[29] Li, XM., et al. "H-DenseUNet: hybrid densely connected UNet for liver and tumor segmentation from CT volumes." IEEE transactions on medical imaging 37.12 (2018): 2663-2674.
[30] Zhang, HY., et al. "mixup: Beyond empirical risk minimization." arXiv preprint arXiv:1710.09412 (2017).
[31] A. Krizhevsky, I. Sutskever, G.E. Hinton Imagenet classification with deep convolutional neural networks Commun. ACM, 60 (6) (2017), pp. 84-90.

Note：Hu Ruiwen, Tianrun Wang, Jing Yaxing, Tangyu Xu, Feiyu Chen&These authors contributed equally to this work and should be considered co-first authors.

Pisco Med Publishing

Research Progress on Influencing Factors of Refractive Error in Preschool Children

Xinyue Zhang

Huzhou College, Huzhou 313000, China.

Abstract: Preschool is the key period of children's visual function development, which is called the "critical period of visual development plasticity". Any abnormal stimulus during this period can have an adverse impact on children's vision. Ametropia is the main cause of poor vision in preschool children. There are many reasons for ametropia. This paper reviews the influencing factors of ametropia in preschool children in recent years, which are classified into three aspects: demographic factors, physiological factors, and lifestyle factors.

Keywords: Influencing Factors; Ametropia; Preschool Children

1. Definition and research status of ametropia

Ametropia refers to that the parallel light cannot accurately focus on the retina of the fundus to result in a blurred image after the refraction of the refractive system of the eye. If the light is focused in front of the retina, it‘s myopia; When the light is focused behind the retina, it’s hyperopia; Light cannot converge into focus, which is astigmatism; All three will lead to blurred vision.

In recent years, with the wide use of electronic products and bad eye habits, more and more preschool children with ametropia have been detected. The National Health Commission released the survey results of myopia among children and adolescents in 2018. The results showed that the overall myopia rate among adolescents was 53.6% in 2018. Therefore, it is necessary to carry out myopia screening, correction and health guidance for children and adolescents in China from the pre-school stage.

2. Influencing factors of refractive errors in preschool children

2.1 Demographic factors

2.1.1 Age

The detection rate of refractive abnormalities in children is related to age distribution. According to the visual acuity screening of 3352 infants aged 6 months to 3 years, Chen L.S. [1] found that before the age of 3, the abnormal rate gradually decreased with the increase of age ($P<0.01$). Zhang G.Y. [2] 's survey of 4~7 years old children found that with the increase of age, the incidence rate of hyperopia decreased, and the incidence rate of myopia increased.

2.1.2 Gander

The differences in the investigation and statistics of refractive errors of children of different genders are not uniform. According to Gao H.Q. [3]’s research, the abnormal rate of total anisometropia in girls (2.3%) was higher than that in boys (1.9%). However, some studies [4] show that refractive errors of preschool children have nothing to do with gender, which may be related to regional differences and too few research samples.

2.1.3 Race

Research [5] shows that in the United States, there are differences in the myopia rate of children of different descent. The

highest myopia rate is 18.5% for Asians, while only 4.4% and 6.6% for whites and black Americans. It points out that this is jointly affected by genetic and environmental factors. This may be due to related to the fact that Asian children are under more study pressure and the differences in educational methods between Asia and some western countries.

2.1.4 Regional distribution

The detection rate of ametropia in children is unevenly distributed in various regions, and the difference between urban and rural areas is obvious. The results of study [6] show that the detection rate of refractive errors in urban children is higher than that in rural children. There are significant differences in the prevalence of myopia between urban and rural children, and they all show an upward trend. This may be related to the gap between urban and rural economic income levels, heavy study tasks for urban children, more exposure to electronic products, more rural population, but less testing.

2.2 Physiological factors

2.2.1 Genetic factors

Parental myopia is a risk factor for ametropia in preschool children. At present, the genetic patterns of abnormal vision in clinic are mainly divided into autosomal inheritance and X-chromosome inheritance. Autosomal inheritance has nothing to do with gender, and the prevalence of children is 50%. In X-chromosome inheritance, the prevalence of women and the probability of carrying disease genes are higher than that of men. Zhang G.Y. [2] study showed that the incidence rate of abnormal vision in all age groups was significantly higher than that in family history without myopia and related ophthalmopathy (x^2= 48.08, P<0.001), which is consistent with the results of Long Qi [7].

2.2.2 Perinatal factors

Preterm birth, low-birth-weight infants, history of fetal protection treatment during pregnancy, history of asphyxia and oxygen inhalation in children, and history of smoking in mother's pregnancy are the influencing factors of children's ametropia. According to the screening of 7886 ametropic children in Haiyan County by Zhou Y.L. [8], children with a history of preterm birth and low birth weight have a high rate of refractive abnormalities. Some studies believe that it is due to the improvement of the current technical level, the survival rate of some low-birth-weight infants and preterm infants has also increased, the incidence of retinopathy in preterm infants is higher, and the blindness rate is significantly higher than that of full-term infants. The investigation results of Fan T, Shi H.Q. [9] and others showed that the infection of Toxoplasma gondii, rubella virus and other microorganisms during pregnancy and adverse drugs in patients with a history of pregnancy fetal protection treatment would lead to a higher rate of visual impairment during pregnancy than those without that, and the difference was significant. The research of Zhang G.Y. [2] shows that the rate of low visual acuity of those with intrapartum asphyxia is higher than those without asphyxia, and the difference is significant. Therefore, avoiding intrapartum asphyxia can reduce the ultraviolet radiation in neonatal warm box phototherapy and reduce the occurrence of fundus lesions. At the same time, At the same time, a study [8] found that the proportion of abnormal refraction of babies born to pregnant women with smoking and alcohol history was higher than that of normal children (P<0.05). Therefore, it is very important to prevent ametropia in children and carry out health care and physical examination during pregnancy.

2.3 Lifestyle factors

2.3.1 Activity factors

Outdoor activities, bad eye habits, use of electronic products and participation in after-school interest classes are the influencing factors of children's ametropia. Bad eye habits, including long-time eye use, not paying attention to active rest, too close eye use, etc., lead to excessive or harmful eye use, which will lead to abnormal vision of children. Tang M.H. [10]'s research shows that outdoor exercise is a protective factor for ametropia because appropriate outdoor activities are conducive to reducing the synthesis of melatonin in the retina and increasing the content of dopamine. Long Qi [7] showed that many

kinds or long time of bad eye use are independent factors affecting children's abnormal vision. Xie J.Y.'s research shows that children who participate in after-school interest classes are more likely to have abnormal vision. This result may be related to the fact that children who participate in after-school interest classes spend too much time with their eyes and do not pay attention to maintaining good eye habits.

2.3.2 Disease factors

Some disease factors may also lead to abnormal vision, which may be caused by the transmission of some pathogens to the eyes. For example, Jia Wei [4] found that allergic rhinitis is an independent risk factor for ametropia in children. Allergic rhinitis can lead to long-term eyes without rest and visual development disorders.

2.3.3 Dietary factors

Children's picky eating and chewing will affect children's nutritional status, resulting in abnormal vision. Xie J.Y. [11] found that children with picky eating habits will lead to abnormal vision (x^2= 6.398, $P<0.05$). Picky eating habits will lead to the lack of some trace elements (such as selenium, zinc, chromium, and other elements closely related to the incidence of myopia), and damage the structure of eye fundus tissue, thus affecting vision. Picky eating habits may also lead to children's light weight. Zhang G.Y. [2] found that the abnormal visual acuity rate of children in the group with weight lower than two standard deviations was higher than that in the group with normal weight (X^2= 7.70，$P<0.05$). Zhou M.Y. [12] showed that regular eating of green vegetables (OR=0.122) and hard food (OR=0.357) are the protective factors of children's refractive error.

2.3.4 Sleep factors

Children have enough sleep time is the protective factor of ametropia. Fan T [9] found that sleep time (≥8 hours) is a protective factor for children's vision. Less sleep time can affect people's overall mental state and physical constitution, which is associated with myopia.

2.3.5 Family environmental factors

Family environmental factors include physical environmental factors such as family lighting environment, social environmental factors such as parents' educational level and income level, parents' cognitive behavior of children's vision protection, etc. Some studies have pointed out that led lamps at home are more likely to cause myopia in children than incandescent lamps or fluorescent lamps. The reason is related to the continuous flashing light of LED lamps. Experiments have proved that the continuous flashing light can induce the binding of 5-HT and 5-HT2A receptor, resulting in progressive myopia in guinea pigs. Zhang G.Y.'s research shows that the children of fathers with higher education have a higher rate of normal vision. This may be related to the fact that parents with higher educational level pay more attention to their children's vision protection and can scientifically arrange their children's learning and activity time. Zhou Y.L.'s survey showed that the proportion of children with refractive abnormalities in low-income families was higher than that in other families ($P < 0.05$). This is contrary to the results of Xu LAN [13]. The reason may be that parents with higher education have high demands on children's study, which increases the length of children's eye use, and children in high-income families may use more electronic products.

Conclusion

Preschool children are the key period of visual development, in which demographic factors, physiological factors and lifestyle factors have important influence on children's visual development. Therefore, it is of great significance to strengthen the visual screening of preschool children, publicize the knowledge of perinatal prevention and health care and the basic health knowledge of correct eye use, to improve the adverse environment and take active outdoor activities, these are of great significance in restoring the visual development of preschool children.

References

[1] Chen, LS., Analysis of the results of vision screening for 3352 infants aged 6 months to 3 years [J]. China Health Industry, 2019, 16(26): 188-189. DOI: 10.16659/j.cnki.1672-5654.2019 .26.188.

[2] Zhang, GY., Analysis of factors affecting visual development of preschool children [J]. China Journal of Child Health, 2005(02):174-176.

[3] Gao, HQ., Wang, Y., You, JH., Zhu, H., Analysis of the refractive status of preschool children in Suzhou High-tech Zone [J]. Chinese School Health, 2022, 43(01): 133-136. DOI: 10.16835/j. cnki.1000-9817.2022.01. 030.

[4] Jia, W., He, Z., Gui, MR., Xiao, LJ., Analysis of the results of the survey on the refractive status of preschool children in Bao'an District, Shenzhen for 3 consecutive years [J]. Chinese and Foreign Medicine, 2021, 40(07): 41-43+ 53. DOI: 10.16662/j.cnki.1674-0742.2021.07.041.

[5] Kleinstein Robert N, Jones Lisa A, Hullett Sandral, Kwon Soonsi, Lee Robert J, Friedman Nina E, Manny Ruth E, Mutti Donald O, Yu Julie A, Zadnik Karla. Refractive error and ethnicity in children. [J]. Archives of ophthalmology (Chicago, Ill.: 1960),2003,121(8).

[6] Tian, F., Zou, ZX., Ying, L., Zhao, Q., Zhou, SR., Research progress on the incidence and influencing factors of myopia in left-behind children [J]. Sichuan Medicine, 2021, 42(12): 1276-1280. DOI: 10.16252/j .cnki. issn1004-0501-2021.12.020.

[7] Long, Q., Tang, XR., Wu, JJ., Tian, M., Zhang, JM., Investigation and analysis of myopia status and its influencing factors in preschool children [J]. Nursing Practice and Research, 2022, 19(03): 355-358.

[8] Zhou, YL., Yang, WH., Shen, XF., Analysis of refractive abnormalities in preschool children and its influencing factors [J]. China Maternal and Child Health, 2015, 30 (17): 2759-2762.

[9] Shi, HQ., Wang, J., Hu, XY., Wang, HB., Chen, JJ., Analysis of the current situation and influencing factors of refractive development of preschool children in urban areas of Shanghai [J]. China Journal of Child Health, 2017, 25(08): 809 -812.

[10] Tang, MH., Zhao, GM., Jiang, YG., Zhu, H., Li, YM., Chen, NE., He, YP., Yao, CX., Analysis of the current situation and influencing factors of vision health among 2036 children and adolescents in Songjiang District, Shanghai [J]. China Journal of Child Health, 2022, 30(03):319-324.

[11] Xie, JY., Yan, XQ., Zeng, J., Zhou, J., Liu, QJ., Analysis of 20327 cases of 6-year-old children's vision screening results and related factors [J]. China Primary Health Care, 2020, 34(08): 60-62.

[12] Zhou, MY., Mo, BQ., Yan, Y., Analysis of living environment factors for children with refractive errors in Chuzhou City [J]. Practical Preventive Medicine, 2018, 25(12): 1445-1447.

[13] Xu, L., Xue, LL., Analysis of the current situation and influencing factors of visual acuity among 12 972 preschool children in Minhang District, Shanghai [J]. China Primary Health Care, 2021, 35(04): 74-76.

Pisco Med Publishing

Application of Nanotechnology in Oral Implantation Based on Exercise-Induced Tooth Injury

Yuxian Zhang*, Yao Huang*, Xinyi Chen, Jingchen Zhang, Jiayi Gao, Yibo Wang
Suzhou University, Suzhou 215031, China.

Abstract :With the development of sports in various countries, more and more people participate in sports, and the rate of sports injuries to the oral and maxillofacial system also increases, especially the dental injuries caused by boxing are more common. At the same time, with the improvement of modern production, people's basic needs have been continuously met, and more and more people have begun to pay attention to their physical health and appearance characteristics. Among them, dental plastic correction and restoration have received great attention. In addition, with the application of nanotechnology in various fields in recent years, scholars at home and abroad have also tried or have continued to introduce nanomaterials into oral clinics, in order to improve and develop the application of oral materials, so that the oral clinic can be continuously improved and developed. Therefore, this paper reviews the current situation of sports injury of the oral and maxillofacial system, the mechanical analysis of tooth injury, the current situation of tooth restoration and the application of nanotechnology in the field of oral implantation.

Keywords: Sports; Alveolar Bone Injury; Nanotechnology; Oral Implantation

1. Introduction

In maxillofacial injuries, the injury to the teeth caused by boxing is more common [1]. According to the author's statistics [2], among the 770 maxillofacial injuries, 174 (22.60%) were dental injuries. Oral soft tissue injury is easy to bleed, and it is necessary to stop the bleeding in time. Tooth fractures are common in clinical practice, and different degrees of damage are difficult to repair, and the results are also different. Common restoration methods include removable dentures, fixed bridge braces and dental implants, among which dental implants are currently the most popular and suitable treatment for broken teeth. Tooth damage is mainly reflected in oral soft tissue damage, tooth fracture, alveolar bone fracture and tooth dislocation. The alveolar bone is a part of the skeleton of the whole body. The decrease in the bone density of the alveolar bone can weaken the structure of the jawbone and cause fractures easily. When oral and maxillofacial trauma is caused by sports and other reasons, the risk of anterior tooth loosening, dislocation and alveolar bone injury increases, and it is more common in clinical practice. However, due to insufficient bone mass during the treatment, the replantation in the operation area is often unsuccessful, or the denture repair in the later defect area is difficult to obtain effective support, resulting in decreased occlusal function and damaged appearance. If artificial bone can be used to repair the defect in time after trauma, it is expected to improve the height and fullness of the alveolar bone, establish a bony support structure, and create conditions for later denture repair or dental implantation [3].

1.1 Current status of oral and maxillofacial movement injuries

The oral cavity and maxillofacial region are the beginning of the respiratory tract and digestive tract, connected to the skull above and the neck below. The upper and lower jaws are the main skeleton, with teeth and tongue, rich blood supply, and the trigeminal nerve and facial nerve are distributed in it. These special anatomical and physiological structures are the important basis for the injury characteristics of this part.Oral and maxillofacial injuries are also common in clinical practice, mainly including soft tissue injuries, pressure groove injuries, jaw fractures and other comprehensive fractures. Injuries to the oral cavity and maxillofacial area have a small fatality rate, but are extremely destructive to the face and function, and their treatment has become one of the directions that medical care has paid more and more attention to in recent years. Among the

many sports injuries, oral and maxillofacial injuries have long received attention due to their high incidence, long treatment time, high treatment costs, and greater psychological impact on athletes, and have been recognized in many countries for a long time. are the most common sports injuries[4]. A survey of 409 athletes showed that the sport with the highest injury rate was wrestling (83.3%), followed by boxing (73.7%), basketball (70.6%) and karate (60%) . Most of these injuries occur in the maxilla, especially the maxillary anterior teeth are the most vulnerable[5].

1.2 Mechanical analysis of tooth damage

Teeth can maintain firmness, mainly relying on the support of gingiva, cementum, periodontal ligament and alveolar bone. At the same time, due to the point-like contact between the teeth, the teeth are arched to form a dental arch, which increases the overall stability of the teeth. resistance. Under the action of severe external force, the gums, periodontal ligament fibers, and alveolar bone of the tooth are damaged, and the connection between the tooth and the alveolar bone is interrupted and falls off. Healthy teeth can withstand large vertical forces, but have poor tolerance to horizontal forces and rotational forces. These two external forces can cause horizontal displacement of teeth, loosening of teeth, and finally tooth dislocation [6]. Some scholars believe that [7]: the ratio of the tooth's resistance to vertical external force to that of horizontal external force is 62:1. Some people have tested that the vertical force that a tooth can accept is 485.7kg, while the horizontal force can only be tolerated. Tolerate 7.5kg. According to the determination: the world's top level boxer punching power can reach 500kg. Boxing feet can cause displacement or dislocation of teeth.

1.3 Current status of tooth restoration

The oral and maxillofacial area is a prominent and exposed part of the human body, and its trauma is often accompanied by alveolar trauma.If the alveolar bone defect combined with alveolar trauma is not repaired in time, the teeth on both sides will be displaced to the missing side, and the maxillary teeth will be displaced to the opposite side, which will lead to the reduction of the interdental space and the narrowing of the alveolar bone to a certain extent. Low and flat, it is not conducive to the restoration of implant dentures and traditional dentures, and affects the occlusal function and appearance. The traditional treatment method is to first perform debridement and suture for alveolar trauma, arch splint fixation and root extraction, etc., and the denture is restored after the alveolar bone and mucosal damage has healed [3]. However, with the gradual improvement of people's requirements for the quality of life, people pay more attention to the appearance and image, so they also have higher requirements for the aesthetics of teeth when restoring teeth. Dental implants are widely used in dental restorations because of their high aesthetics, comfort, and chewing rate, meeting people's requirements for aesthetics [8]. The basis of dental implant restoration is sufficient alveolar bone volume, but the problem of insufficient dental implant bone volume often occurs in dental implant restoration, which brings difficulties to dental implant restoration [9]. Therefore, the development of ideal artificial bone materials to repair bone defects has become the focus of research in the fields of medicine and biomaterials.

2. Technology and application

2.1 Surface Nanotechnology

With the development of nanomaterials and nanotechnology, surface nanotechnology has become an important direction in the development of surface technology, and it is also one of the important contents of today's nanotechnology.Surface nanotechnology is to prepare some materials into nano-scale powders by modern surface preparation technology and fix them on the surface of objects, so that the materials can obtain new functions and structures, such as high hardness, wear resistance, corrosion resistance, etc. Using nano-surface technology Karksson M[10] et al. formed a nanoporous alumina coating on the surface of titanium alloy implants, and co-cultured with human osteoblasts in vitro. The results were detected by biochemical and morphological methods. Osteocytes showed a normal growth pattern, the number of cells increased continuously, and the phenotype of osteoblasts was normal. Polyacrylamide gel electrophoresis and Western blotting showed that the nanoporous alumina coating could adsorb fibronectin, which was beneficial to bone-implantation. Early healing of the body interface.

The long-term stability of implants is not only dependent on osseointegration, but also affected by the healing of soft tissue around the implants. Areva S[11] et al. applied the sol-gel method to form a nano-scale porous titanium dioxide coating on the surface of pure titanium implants and implanted them into the body. After two days of implantation, the adhesion between the coating material and the surrounding soft tissue was observed. The nano-coated implants quickly made contact with connective tissue, while the pure titanium control group formed a fibrocystic encapsulation on the implant surface. This good soft tissue attachment may be due to the titania coating initiating the nucleation and growth of calcium phosphate on the coating surface.

2.2 Nano-artificial bone materials

Nano-scale bone material is a new type of artificially synthesized bone repair material, which has no toxic and side effects, and can be absorbed, degraded and vascularized. The preliminary clinical use of nano-artificial bone shows that it has good biocompatibility with the human body, no immune rejection, and good healing [12]. It is true that sufficient bone mass in the implantation area is the key to the success of oral implantation. Studies have shown[13] that if the bone defect is greater than 1 mm, bone grafting should be sought to facilitate the growth of new bone and the early retention of the implant. nHAC is a new type of nano-hydroxyapatite material independently developed by my country. It imitates the natural bone structure by compounding collagen and hydroxyapatite, and modifies it with polylactic acid, so that the nanostructure is very close to natural bone and has better porosity and biocompatibility. Compared with the previously prepared mineralized collagen composite materials, the mineralized collagen matrix material has more similar characteristics to natural bone tissue in terms of composition and microstructure. Collagen-based nanobone porous framework materials have a three-dimensional pore network structure similar to that of natural cancellous bone, which is beneficial to the transport of nutrients, the migration and growth of cells, and the subsequent formation of new bone tissue after implantation in vivo [14]. Zhu Fei et al.[15] used it to repair mandibular defects in rabbits, and the results confirmed that nHAC has good biocompatibility, and has obvious effects on promoting and accelerating the healing of bone wounds, and the osteogenesis process matches the resorption process of the implant.

3. Conclusion

In a word, in this world where sports are developing and people value self-image, people's attention to teeth is gradually increasing, and clinical medical care also attaches great importance to dental restoration technology and materials used,expect to find more complete methods and more suitable materials. . The birth of nanotechnology and the excellent properties of nanomaterials that are different from other ordinary materials will determine that it will play an increasingly important role in the study of sports injuries, and provide certain methods for the treatment of sports injuries. practical basis. Nanotechnology in stomatology will also promote the further development of prosthodontics, expanding the indications of prosthodontics, improving the biomechanical properties of prostheses, prolonging the service life of dentures, and improving the success rate of implant restorations. In this regard, it plays an irreplaceable role.

About the author: Yuxian Zhang 1998.10, Han, Zhijin County, Bijie City, Guizhou Province, Suzhou University, Cells, Bone development.

References

[1] Zhang, HD., Liu, X., Mei, YL., Characteristics of facial injuries and their forensic identification[J].Journal of Law and Medicine,1999(04):153-158.

[2] Yang, YZ., Wang, K., Clinical analysis of 770 cases of maxillofacial injury[J]. Beijing Stomatology, 1994(01):23-26.

[3] Liao, FQ., Zhu, F., Zhang, H., Zhang, LJ., Clinical study of artificial bone and autologous bone in repairing traumatic alveolar bone defect of middle-aged and elderly anterior teeth[J].Chinese Journal of Osteoporosis,2013,19(07):721-724.

[4] COVASSIN T, BEIDLER E, OSTROWSKI J, et al. Psychosocial aspects of rehabilitation in sports [J]. Clinics in sports medicine, 2015, 34(2) : 199 - 212.
[5] BüCHER K, NEUMANN C, HICKEL R, et al. Traumatic dental injuries at a German university clinic 2004 -2008 [J]. Dental traumatology : official publication of International Association for Dental Traumatology, 2013, 29(2) : 127 -133.
[6] Wang, XM., Liu, J., Jia, XF., Gao, XD., Forensic research on the relationship between boxing-induced tooth loss and periodontal disease[J]. Chinese Journal of Forensic Medicine,2003(01): 23-24+26.
[7] Zhang, JQ., Discussion on the mechanics of loose anterior teeth fixation [J]. Journal of Stomatology, 2002(01):62-63.
[8] Wang, SY., Study on the surgical treatment of insufficient bone mass in the implant area[J]. Contemporary Medicine, 2018, 24(32):49-50.
[9] Tao, K., Clinical application of autologous concentrated growth factor combined with Bio-Oss bone meal in implantation with insufficient bone mass in the upper anterior region [J]. Modern Practical Medicine, 2019,31(1):108-111.
[10] Karlsson M, Palsgard E, Wilshaw PR, et al. Initial in vitro interaction of osteoblasts with nano- porousalumina[J]. Biomaterials, 2003, 24 (18): 3039- 3046.
[11] Areva S, Paldan H, Peltola T, et al. Use of sol- gel- derived titania coating for direct soft tissue attachment [J]. J Biomed Mater Res A, 2004, 70 (2): 147, 169, 178.
[12] Zhu, SQ., He, JC., Research progress of artificial bone substitutes in repairing peri-implant bone defects[J].Medical Review,2010,16(06):863-865.
[13] Ettinger RL, Spivey TD, Han DH, et al. Oral Maxillofac implants[J]. Int J, 1993, 8(4): 420.
[14] Liao, SS., Cui, FZ., Zhang, W., Preparation of collagen-based nano-bone composites for tissue engineering. Journal of Chinese Academy of Medical Sciences, 2003, 25(1): 36-38.
[15] Zhu, F., Wang, Y., Wu, YL., et al. Research on repairing rabbit mandibular defects with collagen-based nano-osseointegrated collagen membrane. Journal of Modern Stomatology, 2004, 18(6): 503-506.

Pisco Med Publishing

Analysis and Development of Nurses in China Nursing Homes in the Context of Aging and Epidemics

Dandan Zheng[1], Heyu Wu[2], Mohammad Ismail Hajary Sagor[3], Yuqi Cao[4]

1. Health Science Center, Yangtze University, Jingzhou 434000, China.

2. Operation Room, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430000, China.

3. Fujian University of Medicine, Fuzhou 350005, China

4. School of Medicine and Health Sciences, Xianning Medical college, Hubei University of Science and Technology, Xianning 437099, China.

Abstract: **Aim:** Examines the factors influencing the shortage of nurses in nursing homes in China in the context of global aging and Corona Virus Disease 2019(COVID-19). **Methods:** literature review. **Results:** China's geriatric nursing profession is still at a low stage of development, and there are great difficulties in the demand for and training of nursing home nurses in China. **Conclusions:** This paper argues that the causes of the nursing home nurse shortage in China are multifaceted and that there is no single global or local measure. Inefficient planning and use of existing nursing resources globally, global demographic conditions under the new coronavirus, and poor recruitment or insufficient supply of new staff. The facts suggest that the nursing home shortage has reached a tipping point. Given the nursing home workforce shortage and unemployment, hopefully these conditions will inspire others in the industry.

Keywords: Elderly Care; Aging Population; Health Care; COVID-19; Shortage of Nurses

1. Background

According to the 7th National Census, China's population aged 60 and over is 264.02 million, accounting for 18.70% of the total population. (Zeng Y, 2015). In addition, in Europe, it is projected that in 2050, nearly 30% of the European population will be over 65 years old and over 11% will be over 80 years old (Knight Frank, 2014). Both the increasing elderly population, and the longer human lifespan will lead to an increased risk of chronic disease, chronic dysfunction and disability, and it will become an inevitable reality,and have an increasing number of elderly people with illnesses at advanced ages every year (Bao ShiRong, 2019). According to current research surveys, there are less than 300,000 professional caregivers in China's elderly care institutions, of whom only 40,000 hold professional practice certificates, and according to the internationally accepted ratio of three elderly people needing one professional caregiver, the demand for elderly caregivers in China is around 10 million, with supply and demand in a serious imbalance (Zhou BoWen, 2018). In recent years, there has been widespread concern about the development of China's elderly care institutions, the training of caregivers, and the development process of the elderly care industry from all walks of life. Elderly care institutions across China are in urgent need of elderly care professionals, and the conflict between supply and demand is very serious. On the one hand, there is a huge gap between the supply and demand of nursing service professionals, and on the other hand, nurses trained through universities tend to work in tertiary hospitals not willing to work in their counterparts and serve the elderly, and the reason for this situation largely stems from the fact that, at present, China does not have a sound assurance system for nursing talents in elderly care services and is unable to attract professional nursing talents to join the elderly care career.

Novel coronavirus SARS-CoV2 (COVID-19) is an Severe acute respiratory syndrome coronavirus-2.During the epidemic, the psychological state of nurses changed. On the one hand, nurses play an important role in epidemic prevention and control and patient treatment, and their social status has been greatly enhanced. On the other hand, many health care

workers have been infected due to occupational exposure, which brings certain troubles to the employment of fresh nursing students.

2. The Chinese government needs to provide high levels of educational opportunities and substantial salaries for older nurses

China needs to accelerate the construction of a human resource workforce to serve the elderly, encourage and guide general universities and vocational colleges to expand the scale of training for professionals in geriatrics, rehabilitation, nursing, and elderly services and management, and improve the training system for elderly services. 2017 saw China's proposal to "implement the Healthy China Strategy" as the platform and guiding ideology for health and hygiene work in the new era. It is a symbol of social development and a goal to strive for. In the context of population aging, it is necessary to accelerate the development of the geriatric healthcare profession with the strong support of the government and enterprises to promote the development of health and social care in China and to attract more nursing talents to participate in the construction of the elderly. Salaries and wages directly affect nurses' career choices, and as salaries and wages in elderly care institutions are generally lower than those in hospitals, nurses are reluctant to work in elderly care institutions; on the other hand, the issue of salaries and wages also largely affects nurses' work attitudes and polarity. With such social perceptions, the salary level of elderly nursing has remained low for a long time and there is a lack of social security. Elderly institutions should pay attention to and strengthen the training of nurses, improve the salary of geriatric specialist nurses, focus on training nurses in management and guidance, and help the nursing staff in the institutions to gradually develop into a professional team. Improve the income level and social status of nursing practitioners, and explore the establishment of an allowance and honor incentive system for nursing practitioners.

3. Nurses in nursing homes dovetail with internationalization to reform talent training mode

One of the reasons for the relatively slow construction and development of elderly care in China is the weakness of the professional workforce in elderly care (Chen Jingzao, 1998). China is facing serious difficulties in caring for the elderly, and it is important to set up relevant majors, reform the talent training model, develop talent training programs, and train professional health and social care professionals to fill the industry, in order to improve the quality of care and promote the development of the health care industry. From the perspective of talent cultivation, the professionalism requirements for competitors in the World Health and Social Care event are of high value for the development of talent cultivation programs for geriatric health management majors or similar majors in universities. Therefore, we need to continue to enhance the employment impact of geriatric nursing and community nursing, train a large number of geriatric nurse specialists, vigorously promote the development of events related to geriatric health and social care programs , and lead nursing employment in a diversified direction.

The lack of nursing care for the elderly will inevitably limit the development of the elderly service industry and even prevent the realization of the basic elderly service needs of the elderly. Therefore, in recent years, the level of skillfulness of nursing services has increased and the professional skillfulness of nurses in elderly care has become an important initiative for institutional elderly care to promote professional standardization. In recent years, geriatric care nursing skills competitions have been launched from the whole country to the provinces and cities, which have had a positive impact on the improvement of the comprehensive ability and practical operation level of geriatric nursing students. Therefore, nursing colleges should use the competition as a grasp to promote learning, teaching, reform and construction, promote nursing education and teaching reform, continuously improve students' comprehensive ability, and train excellent talents for the geriatric nursing profession.We need to build a socialist geriatric care competition mechanism with Chinese characteristics in the context of our national conditions , and improve the cultivation of geriatric nursing talents even more (Zhou Yan, 2021).

5. Discussion

Based on the current global situation, the Corona Virus Disease 2019(COVID-19) that began in 2020 has had a profound and long-term impact on human social development. Although some epidemiological progress has been made in China in recent years, public and governmental attention to age-related infectious diseases has lagged. The erosion of traditional family care for the elderly, coupled with inadequate geriatric care resources, has exacerbated the aging of China's population, and the resulting health challenges for older Chinese are significant, especially in light of the impact of this epidemic (Fang, E. F., Scheibye-Knudsen, M., et al, 2105). As its scale and scope become more widespread,longer-lasting, more influential and more devastating, the health security of vulnerable groups in the epidemic is also increasingly impacted The development of specialist geriatric care is important for its development in China, training professional health and social care professionals to enrich the profession, improve the quality of care and promote the health care industry. In particular, the lack of professional health and social care personnel is a serious problem, leaving many cared-for people unable to meet their own needs and without professional care. Achieving the strategic goal of a healthy China must start with a full range and full cycle of health care services for the people, and talent training and service quality in all levels and types of medical services should be emphasized and improved Based on the WHO's construction concept of promoting healthy aging, China is currently facing severe difficulties in aging care and health care, and the health and social care professions are adapting to the needs of society and the market, which is a test an opportunity and a challenge for the training of practitioners. Specialist geriatric nurses should seize the opportunity to become skilled and practical specialist nursing personnel suitable for society.

References

[1] Knight F., 2014. European Healthcare Care Homes Report London. Knight Frank.

[2] Zeng, Y, George, LK, 2010. Population aging and old-age care in China. In Dannefer, D, Phillipson, C(Eds)Sage Handbook of Social Gerontology. Sage publications, Thousand Oaks/ CA/USA, pp.420-429.

[3] Bao, SR., (2019). The pension service industry development of our country research (Ph.D. Dissertation, jilin university). https://kns.cnki.net/KCMS/detail/ detail.aspx?dbname=CDFDLAST2019&filename=1019140 560.nh

[4] Zhou, BW., (2018). The U.S. department of health services development research (Ph.D. Dissertation, jilin university). https://kns.cnki.net/KCMS/detail/ detail.aspx? dbname=CDFDLAST2019&filename=1019000990.nh

[5] Song, L., Lu, DY., Wu, W., & Lai, QH., (2021). Employment intention and mentality of nursing graduates in the context of epidemic. Education and Teaching Forum (27),37-40.

[6] Chen Jingzao.(1998). The development of modern convalescent enterprise and health resort. Foreign Medicine (Physical Medicine and Rehabilitation)(04),145-149.

[7] Zhou, Y., (2021). Enlightenment of health projects of World Skills Competition on the training of nursing professional skills in China. Shanghai Nursing (04),1-5.

[8] Fang, EF., Scheibye-Knudsen, M., Jahn, H. J., Li, J., Ling, L., Guo, H., Zhu, X., Preedy, V., Lu, H., Bohr, V. A., Chan, W. Y., Liu, Y., & Ng, T. B. (2015). A research agenda for aging in China in the 21st century. Ageing research reviews, 24(Pt B), 197–205. https://doi.org/10.1016/j.arr.2015.08.003