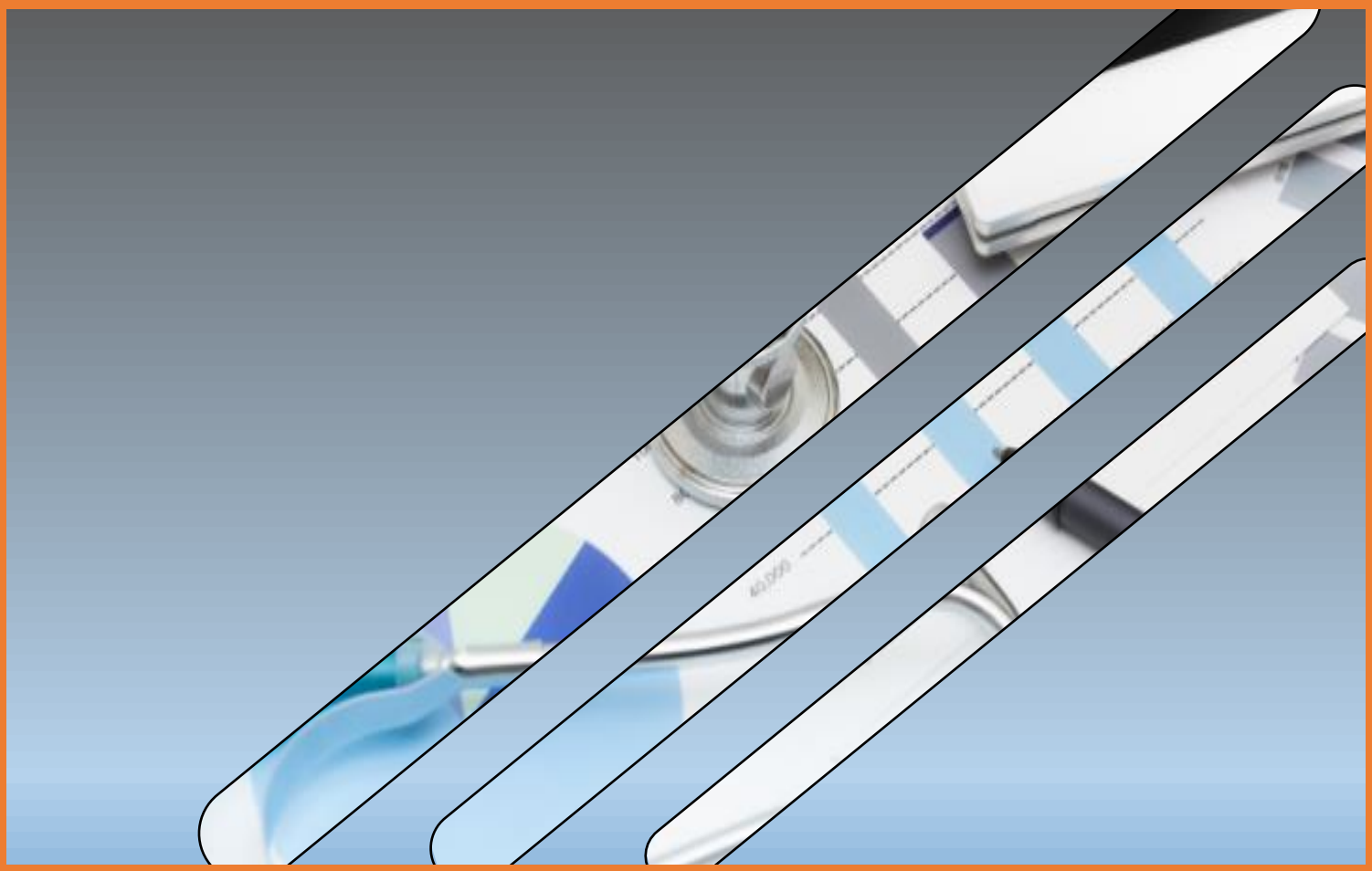

International Healthcare Research Journal (IHRJ)

E - I S S N : 2 4 5 6 - 8 0 9 0

INTERNATIONAL HEALTHCARE RESEARCH JOURNAL

Volume 6, Issue 2 (May 2022)

INTERNATIONAL HEALTHCARE RESEARCH JOURNAL

CONTENTS (VOLUME 6, ISSUE 2, JUNE 2022)

EDITORIAL TEAM

EDITORIAL TEAM

Name of Publisher & Publication Address

Dr. Vatsul Sharma, 66 A, Day Care Centre, Housing Board Colony, Kalka (Panchkula), Haryana, India-133302.

ISSN: 2456-8090 (online)
DOI: https://doi.org/10.26440/IHRJ/0602.05538

SHORT COMMENTARY

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Monkeypox: The Unknown Pandemic?

TANYA SHARMA

ABSTRACT

Monkeypox is a zoonotic illness caused by the monkeypox virus, and it is the most common orthopox virus infection after smallpox was eradicated. Cases of the monkeypox virus have been reported outside of Africa, in nations where the disease is not prevalent, such as Europe, the United States, and Latin America. Can this be start of a pandemic?. The World Health Organization (WHO), which is closely monitoring the viral outbreak Monkeypox, a smaller version of Small pox, has stated that it is unlikely that the outbreak would spread beyond Africa. More than 300 instances of the Monkeypox virus have been reported thus far, both suspected and confirmed. The virus is endemic in Central and West African countries; however the majority of cases have occurred in Europe. Close contact with an infected person is regarded to be the most common method of human-to-human transmission. Transmission may occur during sexual intercourse, according to some evidence. Bites and scratches, bush meat processing, direct contact with bodily fluids or lesion material, or indirect contact with lesion material, such as through contaminated bedding, are all possible ways for animals to transmit disease to humans.

KEYWORDS: Monkeypox, Pandemic, Smallpox

INTRODUCTION

Infection with the monkey pox virus causes monkeypox, an uncommon illness. The Orthopox virus genus is included in the Poxviridae family and is responsible for monkeypox.

Variola virus (smallpox), vaccinia virus (smallpox vaccine), and cowpox virus are all members of the Orthopox virus genus. Monkey pox was initially found in 1958, when two outbreaks of a pox-like disease occurred in study colonies of monkeys, thus the name. Monkeypox was initially discovered in laboratory monkeys in Copenhagen, Denmark, in 1958. The virus does not have a natural reservoir in monkeys. The first human cases were discovered in the Democratic Republic of Congo in 1970.

An epidemic in the United States in 2003 was linked to the sale of rats imported from Ghana at a pet store.
The 2022 monkeypox epidemic, which began in the United Kingdom in May 2022 and has since been confirmed in at least 20 nations throughout Europe, North America, South America, Asia, and Australia, is the first instance of extensive community transmission outside of Africa.

MONKEYPOX AND A PARTICULAR GROUP OF PATIENTS

It has been stressed that the great majority of instances found in dozens of nations throughout the world are in homosexual, bisexual, or males who have sex with men, so that scientists may better understand the problem and communities at risk should take safeguards. "There's critical to explain this because it looks to be a rise in a form of transmission that was previously under-recognized," said Lewis, WHO's Monkeypox technical lead.

However, the health expert cautioned that everyone, regardless of sexual orientation, is at danger. Other scientists and specialists, in contrast to her assertions, have said that the disease was originally discovered in homosexual and bisexual males by chance, and that it might spread swiftly. If it is not controlled, it will spread to other groups. "It's unclear whether this virus is using a new way of transmission, but it's evident that it's still using its well-known mode of transmission, which is close physical contact," says the report "Lewis remarked.

Lewis said it's unclear if monkeypox is spread through intercourse or by intimate contact between individuals who engage in sexual activity, and that the risk to the general public is "minimal".

She also cautioned that among the latest instances, there is a greater number of persons with fewer lesions, which are more concentrated in the vaginal region and can be difficult to notice.

Submitted on: 13-Apr-2022; **Accepted on:** 29-May-2022

"These lesions may last two to four weeks." "And even if they aren't apparent to others, you might still be contagious," she explained.

Last Monday, a top WHO consultant claimed the epidemic in Europe, the United States, Israel, Australia, and other parts of the world was most likely caused through sex at two recent raves in Spain and Belgium.

MONKEY POX AND SARS-CoV-2 CORONAVIRUS

The genome of the monkeypox virus is vast in comparison to many other viruses; it is more than six times the size of the SARS-CoV-2 coronavirus genome. According to Rachel Roper, a virologist at East Carolina University in Greenville, North Carolina, this means they're at least "six times tougher to analyse."

"Normally, fatalities from monkeypox range from one to ten percent, but the presence of Covid-19 might raise mortality since it can make you more immunocompromised and complicate things."

Covid-19 is a deadly illness in and of itself, and if the two coexist, the symptoms may appear to be identical, but identification will be challenging," he stated.

According to the WHO, Covid-19 is an infectious illness caused by the SARS-CoV-2 virus, which spreads in minute liquid particles through an infected person's lips or nose when they cough, sneeze, talk, sing, or breathe. Monkeypox, on the other hand, is a viral zoonotic illness that spreads from person to person by direct contact with lesions, bodily fluids, respiratory droplets, and infected objects like bedding.

MONKEYPOX SYMPTOMS

Monkeypox symptoms in people are comparable to, but less severe than, smallpox symptoms.

Fever, headache, muscular pains, and tiredness are the first symptoms of monkeypox.

The fundamental distinction between smallpox and monkeypox symptoms is that monkeypox produces swollen lymph nodes (lymphadenopathy), but smallpox does not.

Monkeypox has a 7-14 day incubation period (from infection to symptoms), although it can be as short as 521 days.

MONKEYPOX PREVENTION

There are several steps that may be done to avoid becoming infected with the monkeypox virus:

- Avoid coming into touch with animals that may be infected with the virus (including animals that are sick or that have been found dead in areas where monkeypox occurs).
- Avoid touching any objects that have come into contact with a sick animal, such as bedding.
- Separate infectious patients from others who may become infected.
- After coming into touch with infectious animals or humans, wash your hands thoroughly.
- Washing your hands with soap and water or using an alcohol-based hand sanitizer are two examples.
- When caring for patients, wear personal protective equipment (PPE).

MONKEYPOX DIAGNOSIS AND TREATMENT

a). Diagnosis: Lymphadenopathy during the prodromal stage of illness can distinguish monkeypox from chickenpox or smallpox. Diagnosis can be verified by testing for the virus.

Polymerase chain reaction (PCR) testing of samples from skin lesions is the preferred laboratory test. PCR blood tests are usually inconclusive because the virus does not remain very long in the blood. To interpret test results, information is required on date of onset of fever, date of onset of rash, date of specimen collection, current stage of rash, and patient age.

b). Treatment: If antiviral therapy is needed, BMJ Best Practice suggests tecovirimat or the smallpox medication brincidofovir, combined with supportive care (including antipyretic, fluid balance and oxygenation).

If subsequent bacterial or varicella zoster infection is suspected, empirical antibiotic treatment or aciclovir may be utilised.

MONKEYPOX AND PUBLIC HEALTH

According to Palacios, is that genetic monitoring initiatives in Africa, where monkeypox has been a public-health problem for many years, have received little funding.

As a result, virologists are flying blind at the moment, he says, because they have few sequences to compare the new monkeypox genomes against.

He adds that funding organisations have ignored experts who have been warning for more than a decade that new monkeypox outbreaks are possible.

MONKEYPOX AND INDIA

The absence of monkeypox cases in India should not lead to a lack of readiness or a weakening of the virus's guard, according to the WHO.

"We must understand that the danger is imminent with this pathogen registering its presence in previously non-endemic countries, scientists seeing no established travel links to the spread, and community spread indicated in some regions," said Pragya Yadav, scientist and group leader at the maximum containment laboratory at the Indian Council of Medical Research-National Institute of Virology, Pune. "In India, human instances of cow and buffalo pox have been documented, demonstrating animal-to-human transfer. "We haven't been exposed to monkeypox, so it's an unusual infection for us," Dr. Yadav said.

CONCLUSION

People have contracted monkeypox outside of Africa as a result of foreign travel or imported animals, with instances reported in the United States, Israel, Singapore, and the United Kingdom. Monkeypox's natural reservoir has yet to be discovered.

African rodents and non-human primates (such as monkeys) may, nevertheless, carry the virus and infect humans. We should start taking steps before another pandemic starts.

REFERENCES

1. Moore M, Zahra F. Monkeypox. [Updated 2022 May 22]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022. Available from: *https://www.ncbi.nlm.nih.gov/books/NBK574519/* [Last Accessed on 24th March, 2022]
2. WHO. Multi-country monkeypox outbreak in non-endemic countries. Available from: *https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON385* [Last Accessed on 21st May, 2022]
3. WHO. Monkeypox: Epidemiology, preparedness and response for African outbreak contexts. Available from: *https://openwho.org/courses/monkeypox-intermediate*. [Last Accessed on 18th March, 2022]
4. Harris E. What to Know About Monkeypox. JAMA. Published online May 27, 2022. https://doi.org/10.1001/jama.2022.9499
5. Kozlov M. Monkeypox outbreaks: 4 key questions researchers have. (Online Article). Available from: https://www.nature.com/articles/d41586-022-01493-6. [Last Accessed on 28th May, 2022]

Source of support: Nil, **Conflict of interest:** None declared.

Cite this article as:
Sharma T. Monkeypox: The Unknown Pandemic?. Int Healthc Res J. 2022;6(2):SC1-SC3. https://doi.org/10.26440/IHRJ/0602.05538

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ISSN: 2456-8090 (online)
DOI: https://doi.org/10.26440/IHRJ/0602.0539

REVIEW

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Drug Interactions: A Review

PRASAD KRISHNAMURTHY*[1], SUNIL KADAM[2], JACOB MATTHEWS[3]

ABSTRACT

Increased use of drugs as well as polypharmacy has led to increase in incidence of drug interactions. These interactions may lead to medically significant as well as life threatening complications. Not all kind of interactions that can occur with a drug are known. The data in reference safety documents, published literature and safety databases is also limited. Some drugs may also react to certain foods or beverages if taken concomitantly. Most of the interactions come into picture during post-marketing phase of a drug. Latest versions of labelling documents by the manufacturers are informative but not necessarily for newly approved drugs. It is imperative for the healthcare professionals to check for known interactions while prescribing multiple drugs. Detailed diet routine and ongoing medications of subjects also need to be taken into consideration.

KEYWORDS: Drug Interaction, Adverse Drug Reaction, Pharmacokinetics

INTRODUCTION

With increasing polypharmacy and restricted physiological compensation mechanisms in advanced age, the risk of drug interactions and adverse drug reactions naturally increases.[1–3] The clinical significance of drug interactions is indicated by the fact that about 20–30% of the observed adverse effects cannot be attributed to a single medication but are only caused by interactions.[2,3] An intolerable occurrence of interactions that did not occur during the preclinical and clinical development led to market withdrawal for some medications. Even for long-known drugs such as simvastatin and amiodarone, a relevant interaction has only been observed recently. Pharmacokinetic and pharmacodynamic interactions play a significant role in serious adverse drug reactions. The manufacturers' summaries of product characteristics are an important source of information for the physician. In some drugs, the temporal distance from food plays a significant role for the absorption and efficacy of the therapy. Intestinal metabolism is significant for the bioavailability of some drugs and can be influenced by foods such as grapefruit juice. Interactions at this level can lead to extreme changes in bioavailability.

Drug interactions can occur after administration at different levels. At the pharmacokinetic level, release, absorption, distribution, metabolism, and excretion can be impaired by concomitant administration of two or more drugs. At the pharmacodynamic level, similar or contradictory effects can be intensified or reversed at the site of action. The release of a medication depends on its physicochemical properties in connection with the physiological dissolution or release conditions in the gastrointestinal tract. By changing the ambient conditions such as changing the pH value by antacids or proton pump inhibitors, the intestinal motility by metoclopramide or erythromycin, other medicines can therefore impair the release from a formulation.[4] Fiber-containing appetite suppressants and food components can hinder diffusion through increased viscosity and adsorption, and Ca^{2+}, Fe^{2+}, Mg^{2+} and Al^{3+} ions in milk, antacids, and oral iron products can lead to the formation of complexes with tetracycline and fluoroquinolones and thus to a limitation of their efficacy. Penicillin, amoxicillin, and erythromycin are already broken down to an increased extent in the gastrointestinal tract in the case of a prolonged gastric transit time or increased acidity and should therefore be taken on an empty stomach just like isoniazid, levodopa and rifampicin. Furthermore, gastric filling delays gastric emptying depending on the calorie content, which promotes the degradation of acid-sensitive substances such as didanosine, for example. The bioavailability of some drugs like cefuroxime axetil, griseofulvin, danazol, cyclosporine, carbamazepine, spironolactone, phenytoin is significantly improved by fatty meals with prolonged gastric transit time. The cytochrome P450 enzyme system plays a role in intestinal metabolism, especially CYP 3A4. With grapefruit juice, the plasma level of some drugs increases many times over, since flavonoids occurring in grapefruit juice inhibit intestinal CYP 3A4. This in turn results in increased bioavailability of substrates of this enzyme, even if the

Submitted on: 13-Apr-2022; **Accepted on:** 28-May-2022

hepatic enzyme CYP 3A4 is evidently not inhibited by these orally administered flavonoids.[5,6] For many interactions at the level of cytochrome P450 enzymes, it cannot be clearly clarified to what extent the pre-systemic or hepatic metabolism is involved in this. However, for some drugs, pre-systemic metabolism appears to be of great importance[6], and if taken with grapefruit juice, significant increases in plasma concentrations up to nine-fold can be observed.

Intestinal membrane efflux pumps, p-glycoprotein (pGP) being the most well-known, have a protective function by discharging foreign substances after absorption from the enterocytes into the intestinal lumen before they enter the systemic blood circulation.[7] Thus, the interaction between calcium antagonists and digitalis glycosides is probably based on the competition for pGP so that the digitalis level increases with this combination. pGP can also be induced by known enzyme inducers such as rifampicin; this reduces the bioavailability of cardiac glycosides and other pGP substrates. An important example of unforeseen, but relevant interaction from induction of the transporter and CYP system is the concomitant administration of Hypericum perforatum and cyclosporine, which leads to a transplant rejection reaction in some patients. Hypericum perforatum induces pGP and some CYP enzymes, in particular CYP 3A4; cyclosporine is thus eliminated increasingly, and plasma concentrations decrease significantly.[8] In this way, digoxin levels also decrease under Hypericum perforatum, the phenprocoumon action is weakened, and, if oral contraceptives are used, intermediate bleeding up to failure of contraception may occur.[9,10]

The extent of distribution of pharmaceuticals at their site of action is determined by the degree of plasma protein binding. In principle, only the free portion of a substance can be released from the capillaries or become effective at the site of action. The occurrence of interactions by mutual displacement from the plasma protein binding had been overestimated for a long time since there are large extracellular "protein buffer capacities" and a very rapid setting of a new equilibrium by rapid elimination and removal of the free-to-release molecules by diffusion. Therefore, the displacement from a binding can only be effective for pharmaceuticals with high plasma protein binding (>90%), small volume of distribution, narrow therapeutic area, and reduced plasma protein binding reserve [11]. In the event of an existing reduction in the plasma protein binding reserve (hypoalbuminemia, hyperproteinemia, tumor, metabolism or edema-related changes in plasma protein content), the sensitivity of this system naturally increases. Possible consequences of displacement reactions with pharmaceuticals with a narrow therapeutic range are bleeding due to increase of a phenprocoumon action, hypoglycemia due to increased sulfonylurea effect, digitoxin-related cardiac arrhythmias, phenytoin-related central disorders, or respiratory depression due to excessive diazepam effect. In addition to a small volume of distribution and high plasma protein binding, the pharmaceuticals listed here also exhibit a slow metabolism and a lack of renal excretion. Caution is advised especially at the start of use of a displacing comedication.

The metabolism of pharmaceuticals takes place mainly in the liver, but sometimes as early as in the intestinal mucosa, and is subdivided into phase I (oxidation, hydroxylation, etc.) and phase II (glucuronidation, sulfation, etc.). Frequently, the summary of product characteristics for new medicinal products lists the cytochrome (CYP) responsible for the phase I metabolism via which a drug is degraded, and possible interactions can be derived from this. Approximately half of the drugs are metabolized via CYP 3A4; approx. 20% are metabolized via CYP 2D6 and CYP 2C8/9/19, respectively. In the process, a mutual influence on concomitant drugs can occur due to inhibition or induction. While the start and end of an induction usually occur with a delay in time of several days, inhibition occurs immediately. However, the latter also persists after discontinuation of the medication until the new synthesis of the respective enzyme in the event of irreversibility (mechanism-based inhibition), e.g. by erythromycin, chloramphenicol, midazolam, verapamil or grapefruit ingredients. In the case of limited enzyme capacity, substrates with strong enzyme binding affinity (low Km) and a higher concentration hereby naturally displace substances with a lower affinity to the metabolizing enzyme from their binding and thus from metabolism. Displacement reactions affecting medicinal substances with narrow therapeutic range (phenprocoumon, digitalis glycosides, theophylline, antiepileptics) are naturally also of special relevance here. Furthermore, the extent of metabolic interactions within a group of drugs is often very different. Thus, each of the selective serotonin reuptake inhibitors (SSRI; e.g. fluoxetine, fluvoxamine, citalopram, sertraline) affects the cytochrome P450 system at another location and to a different extent. Thus, the phenprocoumon metabolism is inhibited by fluvoxamine and there are case reports for fluoxetine regarding the interaction

with warfarin, sertraline showed a small but significant change in prothrombin time for comedication with warfarin, while citalopram and paroxetine do not cause pharmacokinetic interactions with coumarins.

The p-glycoprotein transporter is present both in the intestine and in the liver and in the kidney and is responsible for transport or elimination of numerous drugs (calcium antagonists, digitalis glycosides, cyclosporine). Taking Hypericum perforatum leads to the induction of the p-glycoprotein transporter and a reduction of the efficacy of cyclosporine, phenprocoumon, digoxin and oral contraceptives. Competition for the plasma protein binding only plays a role in drugs with a protein binding of >90%, narrow therapeutic range, and especially at the beginning of the displacing concomitant medication. Many of the known pharmacokinetic interactions are based on the cytochrome P450 enzyme system. Substrates of CYP 3A4, CYP 2D6, CYP 2C9/19 are most commonly affected. Furthermore, the relationship between intestinal absorption and the extent of liver metabolism (first-pass effect) plays a role in the tendency to develop interactions. Simvastatin thus exhibits a high absorption rate (60–80% in animal experimentation) at the same time as low bioavailability (5%), which indicates a high first-pass effect.

In the context of renal excretion of active pharmaceuticals and metabolites, there may be a competition for active tubular secretion mechanisms which inhibit the clearance of one or both interaction partners. Examples include penicillins or NSAID excretion inhibition by probenecid and other organic acids and inhibition of the elimination of sulfonylureas by sulfonamides, otherwise the "baseline" secretion inhibition of metformin, triamterene or zidovudine by cimetidine. An additional renal insufficiency can intensify such an inhibition of secretion and, e.g., in the case of metformin, which is almost exclusively eliminated renally, can trigger lactate acidosis due to a plasma concentration increase. In the meantime, it is known that the already mentioned pGP also plays a role in renal secretion and that some interactions are based on the competition for this transporter. Furthermore, a group of organic anion/cation transporters was identified which are eliminated by many pharmaceuticals. This can lead to interactions with diuretics; one important example for this is comedication with lithium, which is increasingly reabsorbed due to thiazide and (less often) loop diuretics and can easily lead to toxicity through its narrow therapeutic width. In the summary of product characteristics for the antiviral tenofovir, interactions via the human organic anion transporter 1 pointed out in particular. One would need to know in this respect that this is an important transport route for other antiviral substances but also for ß-lactam antibiotics, loop diuretics, and some non-steroidal anti inflammatory drugs.[12]

Pharmacodynamic – meaning action-related – interactions without changing plasma levels can occur at the level of the same receptor or via different mechanisms of action at the same target cell, the same organ or a control circuit. The risk potential of pharmacodynamic interactions can be well estimated by knowledge of the mechanism of action of pharmaceuticals. The antihypertensive therapy through combination of ACE inhibitors and diuretics shows synergistic effects, while NSAID-related prostaglandin inhibition undoes an anti-hypertensive effect or may lead to the above-mentioned worsening of the renal function. More often than one would think, the combination of verapamil or diltiazem with ß-blockers on the one hand or a combination of aforementioned pharmaceuticals with digitalis glycosides on the other hand leads to serious AV blocks or bradycardia. The most common cause for drug induced gastrointestinal bleeding is gastrointestinal bleeding due to comedication with phenprocoumon or acetylsalicylic acid (ASA) with an NSAID. Often, this combination is caused by various prescribers or due to non-prescription pain medication. Dangerous summations of actions, especially in the case of pre-existing genetic disposition, can also be found in the combination of two QT-time prolonging drugs or two substances affecting the metabolism. The interaction between cotrimoxazole or amoxicillin/clavulanic acid and phenprocoumon is based on synergies directly on the coagulation function, decreased vitamin K synthesis by killing the intestinal bacterial flora and probably also on an interaction in the metabolism.[13] The relevance of an interaction is influenced by, among other things, how high the absorption rate of a drug is and to what extent the affected drug is subject to a first-pass metabolism. In the case of a high absorption rate and pronounced first pass, a tenfold increase of the systemic bioavailability can be induced by the inhibition of the first pass within the context of an interaction. In the kidney, organic and inorganic transporters and the pGP are responsible for secretion and elimination. Competitive displacement can also

occur here.

An information source for relevant interactions, both of pharmacokinetic and pharmacodynamic nature, is the so called summaries of product characteristics of the manufacturers, which are considerably more informative than the information uploaded online. However, when using these summaries of product characteristics, it is necessary to know that, although they are regularly updated, they cannot yet be complete for newly approved drugs. In the case of new substances from an already known group (e.g. proton pump inhibitors), the interactions of the substances already on the market can certainly be mentioned without ever having been proven for the new medication. Interaction information with coumarin is often based on unproven parallel conclusions. Most studies in this regard were conducted with warfarin, which is subject to a different metabolism than the phenprocoumon and therefore cannot necessarily be transferred to this substance. The summaries of product characteristics often also do not indicate whether an interaction is a interaction specifically investigated in the context of a clinical study or whether more-or-less well documented individual case reports have led to the inclusion of this note. Thus, the warning that ß-blockers suppress the hypoglycemia symptoms in diabetics under antidiabetic therapy should not lead to the discontinuation of ß-blockers in patients with diabetes mellitus, since the benefit is documented in terms of clinically relevant endpoints.
Pharmacodynamic interactions result from the pharmacological profile of the individual substances and are usually predictable. They are often not observed due to their apparent triviality. Some pharmacodynamic interactions manifest only in a few, probably genetically predisposed patients e.g. drug induced torsade de pointes arrhythmia or rhabdomyolysis under statins and fibrates. The basis for information regarding interactions in the product information provided by manufacturers is very heterogeneous. They are partially based on clinical studies but are frequently only based on individual case reports.

Drug-drug and drug-meal interactions are of clinical concern for prescribed drugs. Drug interactions contribute to a major part of adverse drug reactions, especially in elderly patients and in patients under polymedication.

CONCLUSION

Numerous drug reactions can be prevented if physicians respond early to the symptoms reported by patients. The number of more frequent and clinically relevant interactions is limited. It can be reduced further by restriction to a few and known drugs. In the case of new prescriptions, especially in the case of rarer or less well-known medicinal products, interactions should always be looked out for. Patients should be encouraged to maintain vigilance and motivated to communicate abnormalities. The use of electronic tools for early detection of potential interactions can only be useful when using validated and clinically relevant information. The vigilance and cooperation of the patient are indispensable.

REFERENCES

1. Thürmann PA. Methods and systems to detect adverse drug reactions in hospitals. Drug Saf. 2001;24(13):961-8. https://doi.org/10.2165/00002018-200124130-00003. PMID: 11735652.
2. Köhler GI, Bode-Böger SM, Busse R, Hoopmann M, Welte T, Böger RH. Drug-drug interactions in medical patients: effects of in-hospital treatment and relation to multiple drug use. Int J Clin Pharmacol Ther. 2000 Nov;38(11):504-13. https://doi.org/10.5414/cpp38504. PMID: 11097142.
3. Jankel CA, Fitterman LK. Epidemiology of drug-drug interactions as a cause of hospital admissions. Drug Saf. 1993 Jul;9(1):51-9. https://doi.org/10.2165/00002018-199309010-00005. PMID: 8347291.
4. Fleisher D, Li C, Zhou Y, Pao LH, Karim A. Drug, meal and formulation interactions influencing drug absorption after oral administration. Clinical implications. Clin Pharmacokinet. 1999 Mar;36(3):233-54. https://doi.org/10.2165/00003088-199936030-00004.
5. Maskalyk J. Grapefruit juice: potential drug interactions. CMAJ. 2002;167(3):279-80.
6. Ducharme MP, Warbasse LH, Edwards DJ. Disposition of intravenous and oral cyclosporine after administration with grapefruit juice. Clin Pharmacol Ther. 1995;57(5):485-91. https://doi.org/10.1016/0009-9236(95)90032-2.
7. Tanigawara Y. Role of P-glycoprotein in drug disposition. Ther Drug Monit. 2000;22(1):137-40. https://doi.org/10.1097/00007691-200002000-00029.
8. Dürr D, Stieger B, Kullak-Ublick GA, Rentsch KM, Steinert HC, Meier PJ, Fattinger K. St John's Wort induces intestinal P-glycoprotein/MDR1 and intestinal and hepatic CYP3A4. Clin Pharmacol Ther. 2000

Dec;68(6):598-604. https://doi.org/10.1067/mcp.2000.112240.
9. Fugh-Berman A, Ernst E. Herb-drug interactions: review and assessment of report reliability. Br J Clin Pharmacol. 2001 Nov;52(5):587-95. doi: 10.1046/j.0306-5251.2001.01469.x.
10. Pfrunder A, Schiesser M, Gerber S, Haschke M, Bitzer J, Drewe J. Interaction of St John's wort with low-dose oral contraceptive therapy: a randomized controlled trial. Br J Clin Pharmacol. 2003 Dec;56(6):683-90. https://doi.org/10.1046/j.1365-2125.2003.02005.x.
11. Rolan PE. Plasma protein binding displacement interactions--why are they still regarded as clinically important? Br J Clin Pharmacol. 1994;37(2):125-8. https://doi.org/10.1111/j.1365-2125.1994.tb04251.x.
12. Perri D, Ito S, Rowsell V, Shear NH. The kidney--the body's playground for drugs: an overview of renal drug handling with selected clinical correlates. Can J Clin Pharmacol. 2003;10(1):17-23.
13. Penning-van Beest FJ, van Meegen E, Rosendaal FR, Stricker BH. Drug interactions as a cause of overanticoagulation on phenprocoumon or acenocoumarol predominantly concern antibacterial drugs. Clin Pharmacol Ther. 2001;69(6):451-7. https://doi.org/10.1067/mcp.2001.115723.

Cite this article as:
Krishnamurthy P, Kadam S, Matthews J. Drug Interactions: A Review. Int Healthc Res J. 2022;6(2):RV1-RV5. https://doi.org/10.26440/IHRJ/0602.05539

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Source of support: Nil, **Conflict of interest:** None declared

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ISSN: 2456-8090 (online)
DOI: https://doi.org/10.26440/IHRJ/0602.05533

REVIEW

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Mandibular Expansion in Orthodontics: A Review

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ABSTRACT

Treatment planning decisions in the transverse dimension have historically been based on the presenting mandibular arch width and form. There are various surgical and non-surgical methods used to correct the transverse discrepancies. Few of the non-surgical methods include Haas expander, Schwarz appliance, Mandibular lip bumper, beta-titanium arch etc. The surgical methods commonly used for mandibular expansion are corticotomy and mandibular symphyseal distraction osteogenesis.

KEYWORDS: Expansion, Mandible, Non-surgical Methods, Surgical Methods

INTRODUCTION

One of the most common skeletal abnormalities related with small basal and dentoalveolar bone.[1] is transverse mandibular deficit. The mandible has received little attention in comparison to maxillary insufficiency. One of the oldest dogmas in orthodontics is the inviolability of the mandibular intercanine distance.[2] Dental alignment, tooth shape and size, musculature, jaw size and shape, facial and cranial patterns, and the dental occlusion all influence the transverse dimension and shape of both dental arches.[3]

One of the most prevalent malocclusions in the primary and mixed-dentition periods is the transverse discrepancy between the maxillary and mandibular arches.[4] In the primary dentition, 14 % of people have posterior crossbite, while 8 % have it in the mixed dentition.[5] These patients may have short posterior transarch widths, crowding, large buccal corridors, and a loss of anterior arch contour.[6] Although jaw bone constriction is usually associated with posterior crossbite, it is not a necessary condition, as the maxilla and mandible can be dentoskeletal compensated to retain jaw relationships that are functional.[7,8] Patients lacking posterior crossbites, in other words, may have major transverse disparities that require treatment.

Dental extraction and arch extension with orthodontic mechanics are the standard methods for addressing mandibular crowding, however the outcomes are unreliable and prone to relapse, especially in adults. In the therapy of this condition, surgery appears to be the sole option.[9]

Previously, the only way to repair transverse mandibular deficit was to do a vertical symphyseal osteotomy, rotate the two hemi mandibles laterally, place a bone graft, and fix it. Due to the possibility of periodontal problems, a lack of proper stiff fixation, the need for a bone graft, and the risk of relapse, this surgical method was not well received. These issues have been decreased or eradicated as a result of distraction osteogenesis. Theoretically, if the extension is done gently, the soft tissues will adapt better and bone will grow in the osteotomy site[1], resulting in higher stability. MSDO produces regenerated bone, which adds to the dimensions of the intrinsic basal bone, and has a potentially bigger effect than other approaches. The numerous techniques for mandibular expansion will be discussed in this review.

NON-SURGICAL METHODS

Concurrent Maxillary and Mandibular Expansion

Because the maxillary first premolars frequently have a palatal inclination, it's difficult to seat a 4-banded appliance, the Haas expander is adapted for concurrent expansion. To keep the expander in place, the first molars are banded, but the first premolars are bonded with a palatal pad and an occlusal wire. It is recommended that the maxillary expander be turned no more than once every other day.

Two first molar bands are used in the mandibular expander. Two 0.060-inch extension arms are included with the expansion screw. A 0.035-inch wire is soldered to these arms to add the necessary length, allowing the

Submitted on: 22-Feb-2022; **Accepted on:** 14-May-2022

wire to extend around 2 mm out from the alveolus before returning to the first molars' midcrown height. This wire continues below the second and first premolars' midcrown level (it can be extended to the canines). For appliance rigidity, the alveolar and midcrown lengths of wire are linked at the first premolar region.[10]

In contrast to maxillary expansion, orthodontists have not generally embraced mandibular expansion in youngsters as a feasible therapeutic option. This is owing to significant evidence that any increase in mandibular intercanine breadth leads to recurrence. RME was paired with mandibular expansion using a Schwarz appliance in a large sample of consecutively treated mixed dentition individuals, according to Brust and McNamara.[11] Both the arch perimeter and the transverse dimension showed clinically significant increases. In another study, O'Grady et al.[12] found that simultaneous enlargement of both arches in children was long-term stable.

The nonsurgical enlargement of the maxillary and mandibular arches is not a "stand-alone" therapy option. It's frequently paired with anterior teeth interproximal reduction (IPR). IPR helps to correct crowding and minimize the degree of black triangles that develop when the incisors are aligned in overlapped teeth and teeth with incisal flare (small at the cervical and broad at the occlusal). The anatomy of the teeth determines the limits of IPR.

According to Adkins et al.[13], for every 1 mm of transarch extension at the level of the first premolar, the arch perimeter increases by 0.7 mm. Thus, arch expansion of 4.0-5.0 mm might create 3.0-3.5 mm of room. Crowding of 4-5 mm can be rectified when paired with IPR. If mandibular crowding is more than 4-5 mm, excision of one incisor or symphyseal distraction osteogenesis may be necessary.

Incremental Expansion Using a Mandibular Lip Bumper

Because of its ability to grow the lower arch, the mandibular lip bumper is useful in nonextraction therapy. Knowing how this device works and how the expansion is dispersed throughout therapy is crucial to using it correctly. The lip bumper enables for both anterior-posterior and transverse enlargement of the mandibular dental arch. It's usually made of 0.0450 stainless steel wire and runs from molar to molar across the mandibular dentition. The wire is kept away from the teeth's facial surfaces, usually near the gingival margin, and may or may not be covered with plastic or acrylic anteriorly. The appliance is designed to fit into tubes on the lower molars and includes adjustment loops just above them. The lip bumper causes forward and lateral expansion of the mandibular dental arch by dislocating the facial musculature, preventing it from coming into touch with the lower teeth, and by allowing the lingual pressures of the tongue to stay imbalanced.

The expansion is thought to occur between the molars, premolars, canines, and an anterior flaring of the incisors, according to the research. The distal push exerted by the facial musculature on the appliance is also employed to tilt the molars distally with the mandibular lip bumper. Many of the dimensional changes that occur during lip bumper use have been quantified by Osborn et al. They discovered that the arch width expanded by 2 mm at the canines, 2.5 mm at the first premolars, 2.4 mm at the second premolars, and 2 mm at the first molars, and the arch length increased by 1.2 mm in their study of 32 patients. Similar findings were found in other investigations.[14]

Mandibular Expansion using Beta-Titanium Arch

The use of a lingual arch or extended archwires for the dentoalveolar growth of an adult mandible has been acknowledged. Different sorts of appliances and processes have employed beta-titanium alloy. Because of its low stiffness and durability, it can be used at various stages of orthodontic treatment. We proposed designing an auxiliary overlay arch for dentoalveolar extension in the maxillary and mandibular arches based on the mechanical properties of beta-titanium wires.[15]

The bimaxillary transverse deficiency was rectified, allowing for the decrease of the wide buccal corridors and the elimination of crowding. As requested by the patient, the grin improvement was achieved with no disruption of speech or swallowing. Vertical and horizontal dental relationships were successfully maintained.[15]

The TMA-EA improved the widths of both dental arches in 60 days. The maxillary intercanine distance grew 4.5 millimeters, the interpremolar distance grew 6 millimeters, and the intermolar distance grew 4 millimeters. Only the interpremolar distance relapsed by 1 mm at the end of treatment; the mandibular intercanine width increased by 3 mm, the interpremolar width increased by 3.5 mm, and the intermolar width increased by 2.5 mm.[15]

When nonsurgical therapy is indicated, an auxiliary expansion arch composed of beta-titanium alloy can be used to correct bimaxillary arch constriction in adult patients. In an adult who was concerned about dental cleanliness, speech, and swallowing due to palatal expanders, the auxiliary arch was an effective way to enhance dentoalveolar maxillary and mandibular expansion.

SURGICAL METHODS

Corticotomy-facilitated Mandibular Expansion

Nonsurgical treatments have been used, including the Schwarz and bihelix appliances, with minimal dimensional change and unclear long-term stability. These investigations found that mandibular arch expansion was limited to alveolar bone and mostly resulted in tooth inclination, with no alterations in the mandibular body. Furthermore, a weakened periodontium as a result of excessive dental expansion and proclination, as well as reduced face aesthetics, have been identified as drawbacks to such therapies. However, combined surgical and orthodontic treatment for adults who require a lateral dimension increase has demonstrated good results. According to recent studies, corticotomy-assisted orthodontic treatment is a widely approved treatment method with a predictable outcome that addresses many of the problems connected with orthodontic treatment.[16]

Selective alveolar decortication is used in corticotomy-assisted orthodontic treatment to generate a state of accelerated tissue turnover, which leads to faster tooth movement and a shorter treatment period. Other benefits of corticotomy-assisted orthodontic treatment include safer extension of restricted arches and improved post orthodontic treatment stability.[16]

Mandibular Symphyseal Distraction Osteogenesis

The narrow mandibular arch is contained in the maxillary arch with crowding of the mandibular teeth in mandibular transverse discrepancy. Mandibular enlargement is difficult to achieve with orthognathic surgery. With symphyseal distraction osteogenesis, the mandibular arch can be adequately expanded without compromising periodontal health. The location and design of an osteotomy are determined by tooth crowding, root configuration, root angulations, space between adjacent roots, the dental and skeletal midline, bone thickness, and bony architecture. To avoid root injury, an intraoral periapical x-ray is beneficial.

The distractor device can be attached to the teeth or the bones. An occlusal coverage orthodontic expansion appliance with a Hyrax expansion screw is produced in a tooth-borne device. 24 hours before surgery, the appliance is cemented. During surgery, micro screws are used to secure the bone-borne device. By using a vestibular technique, the labial cortex is exposed under local anesthetic. The osteotomy site is routinely designated and completed. The appliance is turned on to test that the particles are separated. After a four-day delay, the device is activated twice a day at a rate of 0.5 mm. After a 4- to 6-week consolidation period, orthodontic tooth movement can begin. It is removed under local anesthetic once the consolidation is complete.[17]

The lateral force and strain patterns are significantly affected by the distractor device's orientation. To avoid undesirable biomechanical consequences during bilateral mandibular lengthening, distraction appliances must be placed parallel to the axis of distraction. The lower incisors glide over the palatal surface of the maxillary incisors as the mandible is diverted forward, resulting in a posterior open bite. At this point, box elastic traction should be used to sculpt the callus, allowing for quicker closure of the posterior open bite. To account for relapse, a 2 mm extra distraction should be performed.[17]

A comparable debate currently exists between the three symphyseal distraction designs. Some people believe that using a tooth borne distractor causes more dental/dentoalveolar extension and less skeletal expansion. Other practitioners claim that the bone-borne appliance has a larger skeletal effect because the stresses are applied directly to the mandible. In reality, if the bony resistance is removed (i.e., an osteotomy) and the appliance is rigid enough, the force delivered to the teeth should be directly transferred to the bone, allowing only skeletal changes to occur. During surgically aided fast maxillary expansion, this has been observed several times in the maxilla.[18]

Stability of transverse expansion in the mandibular arch

Because of the distalization of the molars into the narrow region of the wedge, leading in a clockwise rotation of the jaw, non-extraction therapy can sometimes expand the bite or enhance the vertical dimension. All transverse dental cast measurements changed significantly after using the expansion

equipment. Concurrent treatment with the edgewise appliance may have contributed to reductions in arch crowding, arch perimeter, and arch length. According to Housley JA et al, a mandibular fixed edgewise appliance combined with an increasing lingual arch for fewer than 6 months caused an increase in both the transverse and sagittal dimensions of the mandibular arch. The posterior area of the mandibular arch was more stable than the anterior region in terms of transverse expansion. Fixed retention was the sole way to keep the mandibular intercanine width expansion. Lip protrusion did not develop despite the advanced and proclined maxillary and mandibular incisors.[19] The distraction effect can be maintained with any of the normal forms of retention, however the Essix type retainers may not be firm enough to maintain the increased transverse dimension. If an Essix retainer is needed for patient comfort and compliance, it should only be worn during the day and a Hawley retainer should be worn at night. A fixed lower canine-to-canine wire will keep the canine width and anterior alignment in good shape, but it won't help with any posterior expansion. As a result, a Hawley retainer with an integrated lingual support wire is an effective mandibular retention device.[18]

CONCLUSION

Crowding and transverse mandibular deficits can be treated differently with symphyseal distraction osteogenesis. Distraction may offer the same aesthetic benefits as traditional orthodontic expansion techniques, but without the risk of relapse. Mandibular symphyseal distraction osteogenesis is a minimally invasive technique that is performed in a dentist chair under local anesthesia. A basic teeth-borne distractor device can be included into a dental appliance, or a bone-borne distractor device can be fastened to the symphysis with small bone screws. To avoid teeth migration to immature callus during the consolidation period, the interdental space should be maintained.

REFERENCES

1. Del Santo Jr M, Guerrero CA, Buschang PH, English JD, Samchukov ML, Bell WH. Long-term skeletal and dental effects of mandibular symphyseal distraction osteogenesis. Am J Orthod Dentofacial Orthop. 2000;118(5):485-93.
2. Herberger RJ. Stability of mandibular intercuspid width after long periods of retention. Angle Orthod. 1981;51:78–83.
3. Kong-Zárate CY, Carruitero MJ, Andrews WA. Distances between mandibular posterior teeth and the WALA ridge in Peruvians with normal occlusion. Dental Press J Orthod. 2017;22(6):56-60.
4. Schindel RH, Duffy SL. Maxillary transverse discrepancies and potentially impacted maxillary canines in mixed-dentition patients. Angle Orthod. 2007;77(3):430-5.
5. Lombardo G, Vena F, Negri P, Pagano S, Barilotti C, Paglia L, et al. Worldwide prevalence of malocclusion in the different stages of dentition: A systematic review and meta-analysis. Eur J Paediatr Dent. 2020;21(2):115-22.
6. Handelman CS, Balakrishnan M, BeGole EA, Viana GC. Bimaxillary transverse constriction in adults: Short-term follow-up of non-surgical arch expansion. Orthod Craniofac Res. 2020;23(2):202-9.
7. Crossley AM, Campbell PM, Tadlock LP, Schneiderman E, Buschang PH. Is there a relationship between dental crowding and the size of the maxillary or mandibular apical base? Angle Orthod. 2020;90(2):216-23.
8. Handelman CS, Balakrishnan M, BeGole EA, Viana GC. Bimaxillary transverse constriction in adults: Short-term follow-up of non-surgical arch expansion. Orthod Craniofac Res. 2020;23(2):202-9.
9. Alkan AL, Özer M, Baş B, Bayram ME, Çelebi NÜ, Inal S, Özden B. Mandibular symphyseal distraction osteogenesis: review of three techniques. Int J Oral Maxillofacial Surg. 2007 ;36(2):111-7.
10. Handelman CS. Adult nonsurgical maxillary and concurrent mandibular expansion; treatment of maxillary transverse deficiency and bidental arch constriction. InSeminars Orthod 2012;18(2): 134-51.
11. Brust EW, McNamara JA Jr: Arch dimensional changes concurrent with expansion in mixed dentition patients, in Trotman CA, McNamara JA Jr (eds): Orthodontic Treatment: Outcome and Effectiveness, Craniofacial Growth Series, Monograph 30. Ann Arbor, Center for Human Growth and Development, University of Michigan, 1995
12. O'Grady PW, McNamara JA, Baccetti T, et al: A long-term evaluation of the mandibular Schwarz appliance and the acrylic splint expander in early mixed dentition patients. Am J Ortho Dentofacial Orthop 130:202-13, 2006.
13. Adkins MD, Nanda RS, Currier GF: Arch perimeter changes on rapid palatal expansion. Am J Orthod Dentofacial Orthop. 1990;97:194-9.
14. Murphy CC, Magness WB, English JD, Frazier-Bowers SA, Salas AM. A longitudinal study of incremental expansion using a mandibular lip bumper. Angle Orthod. 2003;73(4):396-400.
15. de Araújo Gurgel J, Pinzan-Vercelino CR, Leon-

Salazar V. Maxillary and mandibular dentoalveolar expansion with an auxiliary beta-titanium arch. Am J Orthod Dentofacial Orthop. 2017;152(4):543-52.
16. Ajmera DH, Singh P, Wang C, Song J, Xiao SS, Fan Y. Analysis of dentoalveolar structures with novel corticotomy-facilitated mandibular expansion: A 3-dimensional finite element study. Am J Orthod Dentofacial Orthop. 2017;151(4):767-78.
17. Sahoo NK, Issar Y, Thakral A. Mandibular distraction osteogenesis. J Craniofacial Surg. 2019;30(8):e743-6.
18. Conley R, Legan H. Mandibular symphyseal distraction osteogenesis: diagnosis and treatment planning considerations. Angle Orthod. 2003;73(1):3-11.
19. Housley JA, Nanda RS, Currier GF, McCune DE. Stability of transverse expansion in the mandibular arch. Am J Orthod Dentofacial Orthop. 2003;124(3):288-93.

Cite this article as:
Jangra VK, Sharma A, Sharma R, Sharma S. Mandibular Expansion in Orthodontics: A Review. Int Healthc Res J. 2022;6(2):RV4-RV8. https://doi.org/10.26440/IHRJ/0602.05533

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Source of support: Nil, **Conflict of interest:** None declared

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ISSN: 2456-8090 (online)
DOI: https://doi.org/10.26440/IHRJ/0602.05502

REVIEW

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Health Informatics and Data Analytics as a Career Choice

AYUSH AHLUWALIA[1], AANCHAL SHARMA[1], MANASI SHARMA[2]

ABSTRA

Data analytics and informatics both have become essential for the success and reputation of healthcare organizations and with the current increasing demand for the same by such organisations, a career path seems to be full of success and blooming opportunities. Big data analytics in medicine and healthcare covers integration and analysis of large amount of complex heterogeneous data such as various -omic data (genomics, epigenomics, transcriptomics, proteomics, metabolomics, interactomics, pharmacogenomics, diseasomics), biomedical data and electronic health records data.

KEYWORDS: Data Analytics, Data Mining, Health Informatics, Healthcare Information Systems.

INTRODUCTION

The 21st Century is all about digital economy where data is an untapped valuable asset, almost like oil was in the 18th Century. And just like oil, which when transformed into energy becomes the driving force of many dependent industries, when data is processed and analysed, significantly hikes its value and runs most of the world we live in today. In 2006, Clive Robert Humby, a British mathematician and entrepreneur in the field of data science and customer-centric business strategies gave the popular phrase "data is the new oil"2 and years later we see how data has become an integral part of today's economic models. So, to nobody's surprise, data processing fields have emerged offering aspiring talents with unprecedented opportunities and job options to satisfy the growing data hunger of government and private corporations.

HEALTH INFORMATICS

Also known as healthcare informatics, biomedical informatics or medical informatics.[3] It is considered to be the intersection of computer science, health care and information science.4 Healthcare informatics essentially uses technology to organize and analyse health records to improve healthcare outcomes through better collaboration among the healthcare providers to improve the quality and safety of patient care. As a health informatics professional, you are expected to organize the data in today's evidence-based medicine and you will thus help support patient care, research and bring improvement in quality and legal inquiries.

SIGNIFICANCE IN TODAY'S WORLD

In the era of contactless medical consults due to COVID-19, Health Informatics has become even more essential in the sharing of patient records to allow healthcare providers to collaborate. Smaller clinics too are now relying on data sharing to improve care and thus as a result, job opportunities are increasing.

WHAT IS THE DEMAND?

Not only are the opportunities for people harbouring degrees in health informatics quite high even today, but are expected to further skyrocket in the years that follow. Hospitals and nursing homes are finding it increasingly difficult to find professionals that can bridge the gap between keeping medical records manually and keeping them electronically. There is also a great demand for health informatics professionals in public health organizations, NGO's, health insurance companies, Government and they can also be employed as teachers and researchers in various institutions.[5]

WHAT IS THE SCOPE IN INDIA?[5]

Once graduated with a master's degree in health informatics, the following opportunities are unlocked:

- Academic/Researcher/Consultant
- Medical Director for Informatics
- Clinical Data Manager
- Health Care Webmaster
- Chief Medical Officer
- Pharmacy Systems Analyst
- Medical Director for information System
- Information Security/Risk/Revenue/ Privacy Manager

DATA ANALYTICS

Professionals in data analysis have experienced an exponential increase in demand following the increasing need of data processing and analysis

Submitted on: 16-Mar-2022; **Accepted on:** 03-May-2022

throughout government and private corporations during the age of the internet. So, it is no surprise that jobs in this sector are plentiful with salaries being high with many career opportunities.

ROLE IN HEALTH CARE

With increasing number of healthcare facilities generating digital data sets with electronic record keeping, a significant amount of data, so complex, that ancient processing and storage can no longer be used. In patients that require hospitalisation, data analytics can aid clinicians predict infection risks, deterioration and need for readmission. This can further bring down costs and help in an overall positive outcome. COVID-19 has also impacted health care data analytics as more and more facilities have shifted to electronic data collection for keeping patient records.

TYPES OF HEALTH CARE ANALYSIS[6]

- **Descriptive Analytics:** involves use of historical data for comparisons to discover patterns.
- **Predictive Analytics:** involves use of current and historical data to predict the future.
- **Prescriptive Analytics:** similar to predictive analysis but utilises machine learning to predict the future.

SIGNIFICANCE IN TODAY'S WORLD

No matter how much data these facilities generate, it's no good if they don't know what to do with that data. We therefore need a centralised way of processing and analysing it so it can ultimately be used for the greater good.

WHAT IS THE DEMAND?

Health care organisations require the use of prescriptive and predictive analytics to obtain detailed models that can be used for lowering costs and patient risk in addition to reduce failure of medical equipment, management of supply chain costs and even decrease fraud. Therefore, the demand of professionals that have the necessary skill set are increasingly growing in demand. And with the pandemic, the demand for such professionals is expected to skyrocket.

EMPLOYMENT OPTIONS IN HEALTH CARE:

Various health care facilities, organisations, public health and industries that generate data related to health require the help of data analytics. These might include:

- Private and Govt. Hospitals
- Diagnostic Centres
- Health Insurance Companies
- Health Care Consulting Companies
- Health Organisations
- Health IT Vendors

Pay scale:

As a Health Informatics or Data analysis professional, your salary, much like your responsibilities, vary largely on the employing organisation for whom you might choose to work.

REFERENCES:

1. Ristevski B, Chen M. Big Data Analytics in Medicine and Healthcare. J Integr Bioinform. 2018 May 10;15(3):20170030. https://doi.org/10.1515/jib-2017-0030.
2. Toonders J. Data Is the New Oil of the Digital Economy (Online Article). Available from: *https://www.wired.com/insights/2014/07/data-new-oil-digital-economy/* [Last Accessed on 21st February, 2022]
3. Michigan Tech. Health Informatiocs -MS. (Online Article). Available from: *https://www.mtu.edu/health-informatics/what-is/* [Last Accessed on 21st February, 2022]
4. Discover Data Science. Guide to a Career in Health Informatics Overview. (Online Article). Available from: *https://www.discoverdatascience.org/articles/guide-to-a-career-in-health-informatics/* [Last Accessed on 21st February, 2022]
5. Government of India. Health Informatics: Career Prospects. (Online Article). Available from: *https://www.nhp.gov.in/health-informatics_pg* [Last Accessed on 21st February, 2022]
6. University of Pittsburgh. The Role of Data Analytics in Health Care. (Online Article). Available from: *https://online.shrs.pitt.edu/blog/data-analytics-in-health-care/* [Last Accessed on 22nd February, 2022]

Cite this article as:
Ahluwalia A, Sharma A, Sharma M. Health Informatics and Data Analytics as a Career Choice. Int Healthc Res J. 2022;6(2):RV11-RV13. https://doi.org/10.26440/IHRJ/0602.05502

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Source of support: Nil, **Conflict of interest:** None declared.

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ISSN: 2456-8090 (online)
DOI: https://doi.org/10.26440/IHRJ/0602.05540

CASE REPORT

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Vancomycin Induced Nephrotoxicity: A Case Report

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ABSTRACT

Nephrotoxicity associated with vancomycin is a commonly feared and mainly preventable adverse effect. Non-severe cases of vancomycin nephrotoxicity resolve upon discontinuation of the medication. We present the case of a 45-year-old man who developed renal dysfunction following vancomycin antibiotic therapy as a result of lack of dose adaptation to measured serum nadirs.

KEYWORDS: Vancomycin, Nephrotoxicity, Renal Dysfunction

INTRODUCTION

Acute renal dysfunction is a known side effect of vancomycin therapy. If several potentially nephrotoxic drugs are combined, the risk of developing acute kidney injury with vancomycin increases.[1] In order to avoid drug induced toxicities and to achieve effective efficacy levels, therapeutic drug monitoring is routinely recommended for vancomycin. According to a study, a serum nadir of 10 to 15 µg/mL must be aimed for to avoid resistance to Staphylococcus aureus.[2] In the current case, the administration of vancomycin and a lack of dose adaptation to measured serum nadirs resulted in renal dysfunction with far-reaching clinical consequences.

CASE REPORT

A 45-year-old male patient received in-patient chemotherapy with rituximab, dexamethasone, vincristine, methotrexate, cyclophosphamide, doxorubicin for Burkitt's lymphoma. Valganciclovir was initiated after cytomegalovirus reactivation. The further medication consisted of caspofungin in status post candidemia, cotrimoxazole for prophylaxis of pneumocystis jiroveci pneumonia and hydromorphone. The acute tolerance of the chemotherapy was satisfactory, and the renal retention parameters were always in the normal range. Over the further hospital stay, the patient developed febrile temperatures and significantly increasing inflammatory parameters. As a consequence, a calculated antibiotic therapy with piperacillin/tazobactam and vancomycin was initiated. Vancomycin therapy was started with a dose of 1 g and increased from the second administration to 1.5 g. The first level determination on day 3 yielded a value of 19.2 µg/mL, the calculated absolute glomerular filtration rate (eGFR) was 41 mL/min. Once a nadir of 41.8 µg/mL was achieved on day 4 with unchanged vancomycin administration, vancomycin was discontinued. On day 5, the nadir reached a maximum value of 45.3 µg/mL, the absolute eGFR dropped to 11 mL/min by day 7. Other potentially nephrotoxic drugs such as and cotrimoxazole were paused from day 4. Caspofungin and hydromorphone were continued, piperacillin/tazobactam reduced to twice daily administration. The patient additionally received two liters daily of sodium chloride, furosemide, and calcium and magnesium substitution. On day 16, the paused anti-infective therapy was restarted, adapted to the current absolute eGFR of 51 mL/min. Nevertheless, there was an outbreak of the cytomegalovirus infection, which required a postponement of the next chemotherapy due to the high therapy pressure resulting in a progression of the lymphoma.

DISCUSSION

International guidelines and the Summary of Product Characteristics make reference to monitoring of serum nadirs with vancomycin therapy.[2,3] In the case of the reported patient, a Therapeutic Drug Monitoring was performed as recommended, but the results were not adjusted to the nadirs above the target range (19.2 µg/mL) and the impaired renal function (eGFR 41 mL/min). Practical experiences show that the dosage of vancomycin is often based on empirical values and is passed on verbally. Furthermore, the patient received several potentially nephrotoxic drugs, which worsened the acute renal dysfunction. An increased risk of renal dysfunction for the combination of

Submitted on: 11-Mar-2022; **Accepted on:** 22-May-2022

piperacillin/tazobactam and vancomycin has also been the subject of more intense discussion in recent times. It has been proposed in this that piperacillin potentiates the nephrotoxic effect of vancomycin, but the exact mechanism has not yet been fully explained.[4] In cases of acute kidney injury, appropriate measures must be taken quickly. This includes the review of the medication for nephrotoxic drug substances and, if possible, pausing this medication and, if necessary, replacement with suitable alternatives. Pausing drug substances that are of essential importance, such as the antiviral therapy in the patient in this case report, is problematic. Consequence of the interrupted valganciclovir therapy was the flare-up of the cytomegalovirus infection, where upon planned chemotherapy was postponed.

In order to support the anti-infective therapy in everyday clinical practice, it is recommended to create easily accessible internal standards for the prescribers. In patients with multiple nephrotoxic drugs, worsening of renal function should be watched out for and, if necessary, alternative substances should be used. According to the Summary of Product Characteristics, a dose of 450 mg twice weekly is indicated for valganciclovir with a GFR of 10 to 24 mL/min.

CONCLUSION

The compilation of internal standards is an important component of a safe drug therapy to enforce a rational drug use. Risk cases, for example patients with multiple nephrotoxic drugs, should be monitored especially closely. When creating local standards, evaluating drug-induced nephrotoxicity, dose adjustments/alternative drugs in kidney failure and when performing a Therapeutic Drug Monitoring, a pharmacist can provide valuable input.

REFERENCES

1. Rybak MJ, Albrecht LM, Boike SC, Chandrasekar PH. Nephrotoxicity of vancomycin, alone and with an aminoglycoside. J Antimicrob Chemother. 1990;25(4):679-87. https://doi.org/10.1093/jac/25.4.679.
2. Rybak M, Lomaestro B, Rotschafer JC, Moellering R Jr, Craig W, et al. Therapeutic monitoring of vancomycin in adult patients: a consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm. 2009;66(1):82-98. https://doi.org/10.2146/ajhp080434.
3. Rybak MJ, Lomaestro BM, Rotschafer JC, Moellering RC, Craig WA, et al. Vancomycin therapeutic guidelines: a summary of consensus recommendations from the infectious diseases Society of America, the American Society of Health-System Pharmacists, and the Society of Infectious Diseases Pharmacists. Clin Infect Dis. 2009;49(3):325-7. https://doi.org/10.1086/600877.
4. Burgess LD, Drew RH. Comparison of the incidence of vancomycin-induced nephrotoxicity in hospitalized patients with and without concomitant piperacillin-tazobactam. Pharmacotherapy. 2014;34(7):670-6. https://doi.org/10.1002/phar.1442.

Cite this article as:
Naveen S, Jensen P. Vancomycin Induced Nephrotoxicity: A Case Report. Int Healthc Res J. 2022;6(2):CR1-CR2. https://doi.org/10.26440/IHRJ/0602.05540

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Source of support: Nil, **Conflict of interest:** None declared

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ISSN: 2456-8090 (online)
DOI: https://doi.org/10.26440/IHRJ/0602.05515

ORIGINAL RESEARCH

QR CODE

Comparative Evaluation Between Two NiTi Rotary Files Using CBCT

PRIYANKA PURI[1], ABHISHEK MISHRA[2]

ABSTRACT

AIM: The aim of the study was to evaluate and compare the effects of WaveOne and Protaper Next on volume of dentin removed, centering ability and dentin thickness using CBCT on human mandibular molars.

MATERIALS AND METHOD: Methodology: 50 recently extracted human mandibular molars were taken and divided into two groups i.e. Group 1- Pro taper next and Group -2 Wave One. The distal root was discarded and the mesiobuccal root canals were selected. Further the selected root canals were scanned to standardize the mesial root canal ranging from 150 to 450 followed by root canal preparation. Here CBCT a non invasive technique was used for assessment. The data extracted were tabulated and subjected to statistical analysis for pair wise comparison.

RESULTS: It was seen that Protaper Next showed statistically significant centric ability where as dentin thickness at cervical, middle and apical level and showed no significant differences. Even mean of volume of removed dentin also showed no significant difference ($p>0.05$) between the groups.

CONCLUSION: The inventive method of NiTi rotary system is having better-quality shaping ability in curved canals that results more centered instruments and less canal errors.

KEYWORDS: Root Canal, CBCT, Centering Ability; NiTi, Dentin Thickness

INTRODUCTION

Since the prehistoric time extraction of decayed teeth was the mainly familiar practice but now it has been replaced with restoration of teeth within the limits by common dental clinical procedure which is root canal treatment (RCT).[1] In the RCT there are three main steps which are the complete diagnosis followed by proper preparation and to finish with restoration. Although successful treatment depends upon the clinical experience of dentist but root canal preparation plays a pivotal role in root canal treatment.[2,3] Cleaning and shaping of the root canal system is a crucial step scrupulous debridement of the root canal system and precise shaping of root canal preparation, while preserving the tangible anatomy of the canal is imperative.[2,4]

Even though canal shaping is reasonably trouble-free in straight roots but for curved roots it's been always challenging which requires high skill consecutively to avoid procedural errors.[5,6] Because many complications like ledging, apical perforation, and mid-root strip perforation may distress the triumph of management as it fails to abolish infection of the root canal system which further makes the obturation trickier.[1,7] So, canal shaping should be done in wise manner as it principally decides the further stages of treatment such as irrigation and obturation but conformist stainless steel hand instruments were not able to meet these goals.[8] For that reason, there was introduction of nickel–titanium (NiTi) alloys that have reduced the procedural errors allied with root canal instrumentation and manage the essential time for finishing the preparation.[10] These alloys are having super elastic property which helps the files to stay well centered and shapes the canals with less haulage. Furthermore a variety of instrumentation techniques and instruments like varying tapers, non-cutting safety tips, and varying length of cutting blades, etc have been introduced for reduction of shape preparation related troubles.[9,11] According to the manufacturers, the NiTi rotary instrument such as ProTaper (Dentsply Maillefer, Ballaigues, Switzerland) which was first introduced in 2011 has an enhanced cross-sectional design that proficiently remove dentin and dropping the torsion stress. However, when we use it aggressive manner; it leads to more amount of canal transportation.[4,12] Other

Submitted on: 19-Dec-2021; **Accepted on:** 26-May-2022

type of files were manufactured through an intricate heating–cooling proprietary treatment and are now available as two gold and two blue heat-treated systems. Among them two are used in reciprocating motion (Reciproc Blue, VDW; WaveOne Gold).[13]

Various methods have been used to appraise the canal shape before and after instrumentation of these new NiTi systems with different design, features and kinematics.[14] One such advance technique is CBCT imaging for the investigation of canal geometry and the efficiency of shaping abilities of different instruments. Even we can compare the anatomical structure of the root canal before and after preparation with the help of CBCT.[15,16] Till date fewer studies have been reported \ on the use of cone-beam computed tomography (CBCT) to assess and compare the canal transportation, centering ability of two NiTi files system. Thus, this study was conducted with the aim to compare the centring ability and remaining dentine thickness of two different Nickel Titanium rotary instruments (Protaper Next and Wave One) using CBCT.

MATERIALS AND METHODS

Selection of sample and preparation: For the present study 50 recently extracted human mandibular molars were taken taken from the department of oral and maxillofacial surgery and divided into two groups i.e. Group 1- Pro taper next and Group -2 Wave One. Sample size calculation was done with the help of G-Power software as per the previous studies with 85% confidence. Study design was approved by the Institutional Ethical Committee Board.

For the sample preparation the distal root was discarded and the mesiobuccal root canals were selected. Further the selected root canals were scanned to standardize the mesial root canal ranging from 150 to 450.

Root canal prepration: All samples of Group 1 were instrumented with crown-down methodology using Protaper Next to the working length and samples of Group 2 were also instrumented with crown-down methodology using Wave One to the working length. A freshly prepared 2.5% sodium hypochlorite solution was used for irrigating the root canals and teeth were scanned before and after mechanical preparation with i-CAT CBCT.

Measurement of centring ability: The measurements of the non-instrumented areas and the measurements after root canal preparation were done as follows:

A1: Measurement of the quantity of voxels from the external surface of the mesial portion of the root to the mesial wall of the non-instrumented canal
A2: Measurement of the quantity of voxels from the external root surface of the mesial portion of the root to the wall of the canal after instrumentation

B1: Measurement of the quantity of voxels of the external surface of the distal portion of the root to the distal wall of the non-instrumented canal
B2: Measurement of the quantity of voxels from the external surface of the distal portion of the root to the distal surface of the canal after instrumentation.

Centralization ability ratio was calculated using the values: (A1-A2/B1-B2)

Measurement of Dentin Thickness: Dentin thickness was measured on the axial cuts from the periphery of the pulp space to the outer surface of the tooth in the four directions at the three levels (cervical, middle, and apical).

Measurement of volume of dentin removed: The volume of dentin removed was determined for each canal by subtracting the pre instrumented canal volume from the instrumented canal volume.

Statistical Analysis: The data extracted were tabulated and subjected to statistical analysis using the statistical package for the social sciences IBM SPSS Statistics version 22.0 software and Krushkal Wallis and Mann-Whitney U tests were for Intergroup and Intragroup comparison.

RESULTS

In the present study comparison of the shaping ability of two different file systems having different design features were done by assessing three parameters - centering ability, dentin thickness and volume of removed dentin. While assessing the first parameter i.e. Measurement of centering ability; it was seen that Protaper Next showed statistically significant centric ability in comparison to other groups. (table 1 & 2) and p value was less than 0.05 in the assessment of centering ratio at cervical, middle and apical level

Pre-Instrumentation	Group 1	Group 2	p value
Cervical	0.019 + 0.01	0.024 + 0.02	0.07**
Middle	0.021 + 0.01	0.021 + 0.02	0.6 **
Apical	0.023 + 0.01	0.016 + 0.01	0.01 *

Table 1. Mean and standard deviation values for pre instrumentation of both the groups.

Post - instrumentation	Group 1	Group 2	P value
Cervical	0.025 ± 0.01	0.038 ± 0.02	0.01*
Middle	0.032 ± 0.02	0.036 ± 0.02	0.8**
Apical	0.035 ± 0.01	0.032 ± 0.01	0.5 **

Table 2. Mean and standard deviation values for post instrumentation of both the groups

Levels	Group 1	Group 2	p value
Cervical	1.44 ± 0.49	1.78 ± 0.58	0.04*
Middle	1.78 ± 0.74	1.93 ± 0.68	0.05 **
Apical	1.62 ± 0.52	2.61 ± 1.52	0.004*

Table 2. Mean and standard deviation values for post instrumentation of both the groups

among the two groups and there is significant difference between them (table 3).

Levels	Group 1	Group 2	p value
Cervical	1.44 ± 0.49	1.78 ± 0.58	0.04*
Middle	1.78 ± 0.74	1.93 ± 0.68	0.05 **
Apical	1.62 ± 0.52	2.61 ± 1.52	0.004*

Table 3. Ratio of canal area to root area (Post/Pre)

During the second parameter assessment i.e. Measurement of Dentine thickness it was found that dentin thickness at cervical, middle and apical level and showed no significant differences (P>0.05) between the two groups (table 4) Third parameter analysed in our study was Volume of removed dentin and found that there was no significant difference (p>0.05) between all the groups (table 5).

Instrument	Apical	Middle	Coronal
Protaper Next	0.41 + 0.48	0.39 + 0.45	0.32 + 0.35
Wave one	0.5 + 0.46	0.42 + 0.36	0.37 + 0.39
p value	0 .73 **	0.780**	0.208**

Table 4. Mean and Standard deviation values of both the groups at three different levels

DISCUSSION

Various irretrievable injurious effects occur due to hauling that causes loss of integrity of the root and accommodating the NiTi instruments with towering flexibility can provide improved adaptation of files in curved canals.[1,13] The Protaper Next and Wave One are recently introduced file systems that are distinctly different in their geometric design.[17,18]

Groups	Mean	SD	P value
Protaper Next	0.001960	0.0015133	0.28**
Wave one	0.001720	0.0012423	

Table 5. Mean and standard deviation of volume of removed dentin of the two different systems

In the present study non-invasive CBCT scanning was used because it provides an accurate, reproducible, 3-dimensional evaluation of changes in both dentin thickness and canal centering ability before and after preparation.[12,16,19] The mesiobuccal canal was standardize as it's usually present with most torturous and accentuated curvature. The first parameter evaluated in this study was centring ability and it was seen that there was no statistically significant difference between found between Protaper next and Wave One during pre-instrumentation whereas Protaper Next showed the statistically significant lowest mean ratio while post-instrumentation. Even the pair-wise comparisons among the systems revealed no statistically significant difference. This might be due to the reason that instruments have non cutting tips

that work with minimal apical pressure and function only as a guide to allow easy penetration. The study done by Saber et al. where comparison of Wave One, reciproc & One shape was done and it was concluded that One shape Files failed to remained centred in curved canals whereas there was no significant difference between others.[17,20] In the current study it was also observed that at the cervical and apical levels, there was statistically significant difference between the systems (p = 0.047 and 0.004 respectively) and pair-wise comparisons between the systems revealed that Wave One showed statistically significant highest mean ratio whereas no statistical significant difference was observed between ratios after the two systems were used at the middle level.

In the study measurement of remaining dentine thickness was also done at three different levels between both the groups and no statistically significant difference between Protaper Next and Wave One systems was seen as they both showed the statistically significant lowest mean ratios. Even the amount of remaining dentine between Protaper next and Wave One was similar which may be because of the asymmetric design. Moreover changes in original canal shape and curvature was also not reported in the study. The results are familiar to study done by Celikten et al. where they compared the Protaper next and One shape for evaluation of remaining dentin thickness and reported that there was no significant difference between them.[20,21] Even Arora et al.[17] who found out that greater speed of rotation leads to faster preparation of the canals. Various types of rotary systems are reachable commercially, but still one needs to select cautiously keeping morphology of each canal in mind so that iatrogenic mistakes can be avoided.[19,22] Additional research is enviable to elaborate on its canal transportation, uninstrumented surface area, and conservation of dentin thickness which influences the prognostic solidity of the teeth.

CONCLUSION

Within the limitations of the study; Protaper Next and Wave One systems produced canal preparations with adequate geometry with no significant differences between the two files. The reciprocating file system is having a better file design and tapering motion which adapts to the canal walls in efficient way. The volume of the touched surface of the canal depends on the tooth anatomy and also the instrument cross-section, taper, metal properties, and file size.

REFERENCES

1. Deshpande AN, Joshi NH, Naik KS. In vitro comparative evaluation of cleaning efficacy and volumetric filling in primary molars: Cone beam computed tomography evaluation. Contemp Clin Dent 2017;8:33-7.
2. Anshul Arora, Sonali Taneja, and Mohit Kumar. Comparative evaluation of shaping ability of different rotary NiTi instruments in curved canals using CBCT. J Conserv Dent. 2014 Jan-Feb; 17(1): 35–9.
3. Mustafa M. Comparative Evaluation of Canal-shaping Abilities of RaceEvo, R-Motion, Reciproc Blue, and ProTaper Gold NiTi Rotary File Systems: A CBCT Study. J Contemp Dent Pract 2021;22(12):1406–12.
4. Bhol R, Shetty S, Shetty R, et al. Comparative Evaluation of Canal-shaping Ability between WaveOne and ProTaper Rotary Using Cone-beam Computed Tomography: A Systematic Review. World J Dent 2020;11(5):413–20.
5. Singla MG, Kumar H, Singh N. A comparative evaluation of canal transportation, centering ability, and volumetric increase in the curved canals using thermally treated three nickel-titanium rotary files: A cone-beam computed tomography study. Endodontol 2021;33:75-80.
6. Narayan GS, Venkatesan SM, Karumaran CS, Indira R, Ramachandran S, Srinivasan MR. A comparative evaluation on the cleaning and shaping ability of three nickel titanium rotary instruments using computerized tomography - An ex vivo study. Contemp Clin Denti 2012;3(2):S151-S155.
7. Jain D, Medha A, Patil N, Kadam N, Yadav V, Jagadale H. Shaping Ability of the Fifth Generation Ni-Ti Rotary Systems for Root Canal Preparation in Curved Root Canals using Cone-Beam Computed Tomographic: An In Vitro Study. J Int Oral Health 2015;7(1):57-61.
8. Bansal S, Taneja S, Kumari M, Dhillon M. Comparative evaluation of the shaping ability of rotary systems of varying metallurgy in curved canals and its analysis using cone-beam computed tomography: An in vitro study. Endodontol 2019;31:158-62.
9. Assudani G, Sharma V, Sharma R, Arya A, Setya G, Gulati U. A comparative evaluation of three root canal instrumentation systems in preparation of curved canals using CBCT- An In Vitro Study". University J Dent Scie 2019; 5(2):33-8.
10. Panithini DB, Sita Rama Kumar M, Girija. S. Sajjan, Madhu Varma K, Kalyan Satish R, Madhavi K .A Comparative Evaluation of Canal Transportation and Centering Ability of Three Different Ni-Ti File Systems – An In Vitro CBCT Study. Open J Dent Oral Medi 2021; 9(1):7–13.

11. Jain A, Asrani H, Singhal AC, Bhatia TK, Sharma V, Jaiswal P. Comparative evaluation of canal transportation, centering ability, and remaining dentin thickness between WaveOne and ProTaper rotary by using cone beam computed tomography: An in vitro study. J Conserv Dent 2016;19:440-4.
12. Nazari MK, Mehran M, Farajian ZH. Root canal cleaning efficacy of rotary and hand files instrumentation in primary molars. Iran Endod J 2009;4:53-7.
13. Tabassum S, Zafar K, Umer F. NiTi Rotary Systems: What's New? Eur Endod J 2019; 3:111-7.
14. Abou-Rass M, Frank AL, Glick DH. The anticurvature filing method to prepare the curved root canal. J Am Dent Assoc 1980;101:792-4.
15. Short JA, Morgan LA, Baumgartner JC. A comparison of canal centering ability of four instrumentation techniques. J Endod 1997;23:503-7.
16. Gergi R, Rjeily J A, Sader J. Comparison of canal transportation and centering ability of twisted files,pathfile-protaper system,and stainless steel hand k-files by using computed tomography. J Endod 2010;36:904-7.
17. Hashem AAR, Ghoneim AG & Lutfy RA, Foda MY & Fatab GA, Omar. Geometric analysis of root canals prepared by four rotary NiTi shaping systems.J Endod 2012;38:996-9.
18. Maitin N, Arunagiri D, Brave D, Maitin SN, Kaushik S, & Roy S. an ex Vivo comparative analysis on shaping ability of four NiTI rotary endodontic instruments using spiral computed tomography. J Conserv Dent 2013;l6:219-23.
19. Shehab El Din Mohamed Saber,Phd,& Shaimaa Mohamed Abu El Sadat,Msc. Effect of altering the Reciprocation range on fatigue Life and the shaping ability of waveone Nickel-Titanium Instruments] Endod. 2013;39:685-8.
20. Elsherief SM,.Zayet MK & Hamouda MI. Cone beam computed tomography analysis of curved root canals after mechanical preparation with three nickel-titanium rotary instruments J Biomed Res. 2013;27 2326-335.
21. Khalilak Z , Alavi K, Akhlaghi NMZ, Mehrvarzfar P , Dadresanfar B. Canal-centering ability of three rotary file systems in simulated curved canals: a comparative study.Ind J Dent Res 2009;20:400-3.
22. Kandaswamy D, Venkateshbabu N, Porkodi I, Gali Pradeep. Canal centering ability. J Conserv Dent 2009;12:3-9.

Cite this article as:
Puri P, Mishra A. Comparative Evaluation Between Two NiTi Rotary Files Using CBCT. Int Healthc Res J. 2022;6(2):OR1-OR5. https://doi.org/10.26440/IHRJ/0602.05515

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Source of support: Nil, **Conflict of interest:** None declared

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