Assignment

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Air cleaner

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1 Air cleaner

An air purifier or air cleaner is a device which removes contaminants from the air in a room to improve indoor air quality. These devices are commonly marketed as being beneficial to allergy sufferers and asthmatics, and at reducing or eliminating second-hand tobacco smoke.The commercially graded air purifiers are manufactured as either small stand-alone units or larger units that can be affixed to an air handler unit (AHU) or to an HVAC unit found in the medical, industrial, and commercial industries. Air purifiers may also be used in industry to remove impurities from air before processing. Pressure swing adsorbers or other adsorption techniques are typically used for this.

2 history

In 1830, a patent was awarded to Charles Anthony Deane for a device comprising a copper helmet with an attached flexible collar and garment. A long leather hose attached to the rear of the helmet was to be used to supply air, the original concept being that it would be pumped using a double bellows. A short pipe allowed breathed air to escape. The garment was to be constructed from leather or airtight cloth, secured by straps.[1]

A HEPA filter combined with a Carbon Activated filter, technology used by medical grade air purifiers. [2][3] In the 1860s, John Stenhouse filed two patents applying the absorbent properties of wood charcoal to air purification (patents 19 July 1860 and 21 May 1867), thereby creating the first practical respirator.[4]

In 1871, the physicist John Tyndall wrote about his invention, a fireman's respirator, as a result of a combination of protective features of the Stenhouse's respirator and other breathing devices.[5] This invention was later described in 1875.[6]

In the 1950s, HEPA filters were commercialized as highly efficient air filters, after being put to use in the 1940s in the United States' Manhattan Project to control airborne radioactive contaminants.[7][8]

The first residential HEPA filter was reportedly sold in 1963 by brothers Manfred and Klaus Hammes in Germany,[9] who created the Incen Air Corporation which was the precursor to the IQAir corporation.[citation needed]

3 uses and benefits

Dust, pollen, pet dander, mold spores, and dust mite feces can act as allergens, triggering allergies in sensitive people. Smoke particles and volatile organic compounds (VOCs) can pose a risk to health. Exposure to various components such as VOCs increases the likelihood of experiencing symptoms of sick building syndrome.[10]

COVID-19 Edit Joseph Allen, director of the Healthy Buildings program at Harvard's School of Public Health, recommends that school classrooms use an air purifier with a HEPA filter as a way to reduce transmission of COVID-19 virus, saying "Portables with a high-efficiency HEPA filter and sized for the appropriate room can capture 99.97 percent of airborne particles."[11]

One fluid dynamic modelling study from January 2021 suggests that operating air purifiers or air ventilation systems in confined spaces, such as an elevator, during their occupancy by multiple people leads to air circulation effects that could, theoretically, enhance viral transmission.[12] However, real-life testing of portable HEPA/UV air filters in COVID-19 wards in hospital demonstrated complete elimination of air-borne SARS-CoV-2.[13] Interestingly this report also showed a significant reduction in other bacteria, fungal and viral bioaerosol, suggesting that portable filters such as this may be able to prevent not only nosocomial spread of COVID-19 but also other hospital-acquired infections.

4 purifying techniques

There are two types of air purifying technologies, active and passive. Active air purifiers release negatively charged ions into the air, causing pollutants to stick to surfaces, while passive air purification units use air filters to remove pollutants. Passive purifiers are more efficient since all the dust and particulate matter is permanently removed from the air and collected in the filters.[14]

Several different processes of varying effectiveness can be used to purify air. As of 2005, the most common methods were high-efficiency particulate air (HEPA) filters and ultraviolet germicidal irradiation (UVGI

5 filtration

Air filter purification traps airborne particles by size exclusion. Air is forced through a filter and particles are physically captured by the filter. Various filters exist notably including:

High-efficiency particulate arrestance (HEPA) filters remove at least 99.97Filter HVAC at MERV 14 or above are rated to remove airborne particles of 0.3 micrometers or larger. A high-efficiency MERV 14 filter has a capture rate of at least 75

Cardiac stress test

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Contents

1 Cardiac stress test

A cardiac stress test (also referred to as a cardiac diagnostic test, cardiopulmonary exercise test, or abbreviated CPX test) is a cardiological test that measures the heart's ability to respond to external stress in a controlled clinical environment. The stress response is induced by exercise or by intravenous pharmacological stimulation.

Cardiac stress test Stress test.jpg A male patient walks on a stress test treadmill to have his heart's function checked. Other names Cardiopulmonary exercise test ICD-9-CM 89.4 MeSH D025401 MedlinePlus 003878 [edit on Wikidata] Cardiac stress tests compare the coronary circulation while the patient is at rest with the same patient's circulation during maximum cardiac exertion, showing any abnormal blood flow to the myocardium (heart muscle tissue). The results can be interpreted as a reflection on the general physical condition of the test patient. This test can be used to diagnose coronary artery disease (also known as ischemic heart disease) and assess patient prognosis after a myocardial infarction (heart attack).

Exercise-induced stressors are most commonly either exercise on a treadmill or pedalling a stationary exercise bicycle ergometer.[1] The level of stress is progressively increased by raising the difficulty (steepness of the slope on a treadmill or resistance on an ergometer) and speed. People who cannot use their legs may exercise with a bicycle-like crank that they turn with their arms.[2] Once the stress test is completed, the patient generally is advised to not suddenly stop activity but to slowly decrease the intensity of the exercise over the course of several minutes.

The test administrator or attending physician examines the symptoms and blood pressure response. To measure the heart's response to the stress the patient may be connected to an electrocardiogram (ECG); in this case the test is most commonly called a cardiac stress test but is known by other names, such as exercise testing, stress testing treadmills, exercise tolerance test, stress test or stress test ECG. Alternatively a stress test may use an echocardiogram for ultrasonic imaging of the heart (in which case the test is called an echocardiography stress test or stress echo), or a gamma camera to image radioisotopes injected into the bloodstream (called a nuclear stress test).[3]

2 Stress echocardiography

A stress test may be accompanied by echocardiography.[4] The echocardiography is performed both before and after the exercise so that structural differences can be compared.

A resting echocardiogram is obtained prior to stress. The images obtained are similar to the ones obtained during a full surface echocardiogram, commonly referred to as transthoracic echocardiogram. The patient is subjected to stress in the form of exercise or chemically (usually dobutamine). After the target heart rate is achieved, 'stress' echocardiogram images are obtained. The two echocardiogram images are then compared to assess for any abnormalities in wall motion of the heart. This is used to detect obstructive coronary artery disease.[citation needed]

3 Cardiopulmonary exercise test

While also measuring breathing gases (e.g. O2, VO2), the test is often referred to as a cardiopulmonary exercise test (CPET). Common indications for a cardiopulmonary exercise test is: Evaluation of dyspnea. Work up before heart transplantion. Prognosis and risk assessment of heart failure patients. The test is also common in sport science for measuring athlete's VO2max

4 Nuclear stress test

The best known example of a nuclear stress test is myocardial perfusion imaging. Typically, a radiotracer (Tc-99 sestamibi, Myoview or thallous chloride 201) may be injected during the test. After a suitable waiting period to ensure proper distribution of the radiotracer, scans are acquired with a gamma camera to capture images of the blood flow. Scans acquired before and after exercise are examined to assess the state of the coronary arteries of the patient.[citation needed]

Showing the relative amounts of radioisotope within the heart muscle, the nuclear stress tests more accurately identify regional areas of reduced blood flow.[citation needed]

Stress and potential cardiac damage from exercise during the test is a problem in patients with ECG abnormalities at rest or in patients with severe motor disability. Pharmacological stimulation from vasodilators such as dipyridamole or adenosine, or positive chronotropic agents such as dobutamine can be used. Testing personnel can include a cardiac radiologist, a nuclear medicine physician, a nuclear medicine technologist, a cardiology technologist, a cardiologist, and/or a nurse.[citation needed]

The typical dose of radiation received during this procedure can range from 9.4 millisieverts to 40.7 millisieverts.[6]

5 Function

The American Heart Association recommends ECG treadmill testing as the first choice for patients with medium risk of coronary heart disease according to risk factors of smoking, family history of coronary artery stenosis, hypertension, diabetes and high cholesterol. In 2013, in its "Exercise Standards for Testing and Training", the AHA indicated that high frequency QRS analysis during ECG treadmill test have useful test performance for detection of coronary heart disease.[7]

Perfusion stress test (with 99mTc labelled sestamibi) is appropriate for select patients, especially those with an abnormal resting electrocardiogram. Intracoronary ultrasound or angiogram can provide more information at the risk of complications associated with cardiac catheterization.

6 Diagnostic value

The common approach for stress testing by American College of Cardiology and American Heart Association indicates the following:[8]

Treadmill test: sensitivity 73-90Nuclear test: sensitivity 81(Sensitivity is the percentage of people with the condition who are correctly identified by the test as having the condition; specificity is the percentage of people without the condition are correctly identified by the test as not having the condition).

To arrive at the patient's posttest likelihood of disease, interpretation of the stress test result requires integration of the patient's pretest likelihood with the test's sensitivity and specificity. This approach, first described by Diamond and Forrester in the 1970s,[9] results in an estimate of the patient's post-test likelihood of disease.

The value of stress tests has always been recognized as limited in assessing heart disease such as atherosclerosis, a condition which mainly produces wall thickening and enlargement of the arteries. This is because the stress test compares the patient's coronary flow status before and after exercise and is suitable to detecting specific areas of ischemia and lumen narrowing, not a generalized arterial thickening.[citation needed]

According to American Heart Association data,[citation needed] about 65

Examples of anatomical methods CT coronary calcium score Coronary CT angiography Intima-media thickness (IMT) Intravascular ultrasound (IVUS) Examples of physiological methods Lipoprotein analysis HbA1c Hs-CRP Homocysteine The anatomic methods directly measure some aspects of the actual process of atherosclerosis itself and therefore offer the possibility of early diagnosis but are often more expensive and may be invasive (in the case of IVUS, for example). The physiological methods are often less expensive and safer but are not able to quantify the current status of the disease or directly track progression.[citation needed]

7 Contraindications and termination conditions

Stress cardiac imaging is not recommended for asymptomatic, low-risk patients as part of their routine care.[10] Some estimates show that such screening accounts for 45

Absolute contraindications to cardiac stress test include:

Acute myocardial infarction within 48 hours Unstable angina not yet stabilized with medical therapy Uncontrolled cardiac arrhythmia, which may have significant hemodynamic responses (e.g. ventricular tachycardia) Severe symptomatic aortic stenosis, aortic dissection, pulmonary embolism, and pericarditis Multivessel coronary artery diseases that have a high risk of producing an acute myocardial infarction Decompensated or inadequately controlled congestive heart failure[14] Uncontrolled hypertension (blood pressure¿200/110mm Hg)[14] Severe pulmonary hypertension[14] Acute aortic dissection[14] Acutely ill for any reason[14] Indications for termination:

A cardiac stress test should be terminated before completion under the following circumstances:[15][16]

Absolute indications for termination include:

Systolic blood pressure decreases by more than 10 mmHg with increase in work rate, or drops below baseline in the same position, with other evidence of ischemia. Increase in nervous system symptoms: Dizziness, ataxia or near syncope Moderate to severe anginal pain (above 3 on standard 4-point scale[16]) Signs of poor perfusion,[15] e.g. cyanosis or pallor[16] Request of the test subject Technical difficulties (e.g. difficulties in measuring blood pressure or EGC[16]) ST Segment elevation of more than 1 mm in aVR, V1 or non-Q wave leads Sustained ventricular tachycardia Relative indications for termination include:

Systolic blood pressure decreases by more than 10 mmHg with increase in work rate, or drops below baseline in the same position, without other evidence of ischemia. ST or QRS segment changes,[16] e.g. more than 2 mm[15] horizontal or downsloping[16] ST segment depression in non-Q wave leads, or marked axis shift Arrhythmias other than sustained ventricular tachycardia e.g. Premature ventricular contractions, both multifocal or triplet; heart block; supraventricular tachycardia or bradyarrhythmias[16] Intraventricular conduction delay or bundle branch block or that cannot be distinguished from ventricular tachycardia Increasing chest pain Fatigue, shortness of breath, wheezing, claudication or leg cramps Hypertensive response (systolic blood pressure ¿ 250 mmHg or diastolic blood pressure ¿ 115 mmHg)

8 Limitations

The stress test does not detect:[citation needed]

Atheroma Vulnerable plaques The test has relatively high rates of false positives and false negatives compared with other clinical tests. Females in particular have a higher rate of false positives, which is theorized to be because on average they have smaller hearts.[20]

9 Results

Increased spatial resolution allows a more sensitive detection of ischemia. Stress testing, even if made in time, is not able to guarantee the prevention of symptoms, fainting, or death. Stress testing, although more effective than a resting ECG at detecting heart function, is only able to detect certain cardiac properties. The detection of high-grade coronary artery stenosis by a cardiac stress test has been the key to recognizing people who have heart attacks since 1980. From 1960 to 1990, despite the success of stress testing to identify many who were at high risk of heart attack, the inability of this test to correctly identify many others is discussed in medical circles but unexplained. High degrees of coronary artery stenosis, which are detected by stress testing methods are often, though not always, responsible for recurrent symptoms of angina. Unstable atheroma produces "vulnerable plaques" hidden within the walls of coronary arteries which go undetected by this test. Limitation in blood flow to the left ventricle can lead to recurrent angina pectoris.

electronic laboratory oscilloscope

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Contents

1 Oscilloscope

An oscilloscope, previously called an oscillograph,[1][2] and informally known as a scope or o-scope, CRO (for cathode-ray oscilloscope), or DSO (for the more modern digital storage oscilloscope), is a type of electronic test instrument that graphically displays varying signal voltages, usually as a calibrated two-dimensional plot of one or more signals as a function of time. The displayed waveform can then be analyzed for properties such as amplitude, frequency, rise time, time interval, distortion, and others. Originally, calculation of these values required manually measuring the waveform against the scales built into the screen of the instrument.[3] Modern digital instruments may calculate and display these properties directly.

A Tektronix model 475A portable analog oscilloscope, a typical instrument of the late 1970s

Oscilloscope cathode-ray tube The oscilloscope can be adjusted so that repetitive signals can be displayed as persistent waveforms on the screen. A storage oscilloscope can capture a single event and display it continuously, so the user can observe events that would otherwise appear too briefly to be seen directly.

Oscilloscopes are used in the sciences, medicine, engineering, automotive and the telecommunications industry. General-purpose instruments are used for maintenance of electronic equipment and laboratory work. Special-purpose oscilloscopes may be used to analyze an automotive ignition system or to display the waveform of the heartbeat as an electrocardiogram, for instance.

Early oscilloscopes used cathode ray tubes (CRTs) as their display element (hence they were often referred to as CROs) and linear amplifiers for signal processing. Storage oscilloscopes used special storage CRTs to maintain a steady display of a single brief signal. CROs were later largely superseded by digital storage oscilloscopes (DSOs) with thin panel displays, fast analog-to-digital converters and digital signal processors. DSOs without integrated displays (sometimes known as digitisers) are available at lower cost and use a general-purpose computer to process and display waveforms.

2 History

The Braun tube was known in 1897, and in 1899 Jonathan Zenneck equipped it with beam-forming plates and a magnetic field for sweeping the trace.[4] Early cathode ray tubes had been applied experimentally to laboratory measurements as early as the 1920s, but suffered from poor stability of the vacuum and the cathode emitters. V. K. Zworykin described a permanently sealed, high-vacuum cathode ray tube with a thermionic emitter in 1931. This stable and reproducible component allowed General Radio to manufacture an oscilloscope that was usable outside a laboratory setting.[3] After World War II surplus electronic parts became the basis for the revival of Heathkit Corporation, and a 50$oscilloscopekitmadefromsuchpartsproveditspremieremarketsuccess$.

3 Features and uses

An analog oscilloscope is typically divided into four sections: the display, vertical controls, horizontal controls and trigger controls. The display is usually a CRT with horizontal and vertical reference lines called the graticule. CRT displays also have controls for focus, intensity, and beam finder.

The vertical section controls the amplitude of the displayed signal. This section has a volts-per-division (Volts/Div) selector knob, an AC/DC/Ground selector switch, and the vertical (primary) input for the instrument. Additionally, this section is typically equipped with the vertical beam position knob.

The horizontal section controls the time base or "sweep" of the instrument. The primary control is the Seconds-per-Division (Sec/Div) selector switch. Also included is a horizontal input for plotting dual X-Y axis signals. The horizontal beam position knob is generally located in this section.

The trigger section controls the start event of the sweep. The trigger can be set to automatically restart after each sweep, or can be configured to respond to an internal or external event. The principal controls of this section are the source and coupling selector switches, and an external trigger input (EXT Input) and level adjustment.

In addition to the basic instrument, most oscilloscopes are supplied with a probe. The probe connects to any input on the instrument and typically has a resistor of ten times the oscilloscope's input impedance. This results in a .1 (-10X) attenuation factor; this helps to isolate the capacitive load presented by the probe cable from the signal being measured. Some probes have a switch allowing the operator to bypass the resistor when appropriate.[3]

4 Size and portability

Most modern oscilloscopes are lightweight, portable instruments compact enough for a single person to carry. In addition to portable units, the market offers a number of miniature battery-powered instruments for field service applications. Laboratory grade oscilloscopes, especially older units that use vacuum tubes, are generally bench-top devices or are mounted on dedicated carts. Special-purpose oscilloscopes may be rack-mounted or permanently mounted into a custom instrument housing.

5 INPUTS

The signal to be measured is fed to one of the input connectors, which is usually a coaxial connector such as a BNC or UHF type. Binding posts or banana plugs may be used for lower frequencies. If the signal source has its own coaxial connector, then a simple coaxial cable is used; otherwise, a specialized cable called a "scope probe", supplied with the oscilloscope, is used. In general, for routine use, an open wire test lead for connecting to the point being observed is not satisfactory, and a probe is generally necessary. General-purpose oscilloscopes usually present an input impedance of 1 megohm in parallel with a small but known capacitance such as 20 picofarads.[5] This allows the use of standard oscilloscope probes.[6] Scopes for use with very high frequencies may have 50-ohm inputs. These must be either connected directly to a 50-ohm signal source or used with Z0 or active probes.

Less-frequently-used inputs include one (or two) for triggering the sweep, horizontal deflection for X-Y mode displays, and trace brightening/darkening, sometimes called z'-axis inputs.

6 Probes

Open wire test leads (flying leads) are likely to pick up interference, so they are not suitable for low level signals. Furthermore, the leads have a high inductance, so they are not suitable for high frequencies. Using a shielded cable (i.e., coaxial cable) is better for low level signals. Coaxial cable also has lower inductance, but it has higher capacitance: a typical 50 ohm cable has about 90 pF per meter. Consequently, a one-meter direct (1X) coaxial probe loads a circuit with a capacitance of about 110 pF and a resistance of 1 megohm.

To minimize loading, attenuator probes (e.g., 10X probes) are used. A typical probe uses a 9 megohm series resistor shunted by a low-value capacitor to make an RC compensated divider with the cable capacitance and scope input. The RC time constants are adjusted to match. For example, the 9 megohm series resistor is shunted by a 12.2 pF capacitor for a time constant of 110 microseconds. The cable capacitance of 90 pF in parallel with the scope input of 20 pF and 1 megohm (total capacitance 110 pF) also gives a time constant of 110 microseconds. In practice, there is an adjustment so the operator can precisely match the low frequency time constant (called compensating the probe). Matching the time constants makes the attenuation independent of frequency. At low frequencies (where the resistance of R is much less than the reactance of C), the circuit looks like a resistive divider; at high frequencies (resistance much greater than reactance), the circuit looks like a capacitive divider.[7]

The result is a frequency compensated probe for modest frequencies. It presents a load of about 10 megohms shunted by 12 pF. Such a probe is an improvement, but does not work well when the time scale shrinks to several cable transit times or less (transit time is typically 5 ns).[clarification needed] In that time frame, the cable looks like its characteristic impedance, and reflections from the transmission line mismatch at the scope input and the probe causes ringing.[8] The modern scope probe uses lossy low capacitance transmission lines and sophisticated frequency shaping networks to make the 10X probe perform well at several hundred megahertz. Consequently, there are other adjustments for completing the compensation.[9][10]

Probes with 10:1 attenuation are by far the most common; for large signals (and slightly-less capacitive loading), 100:1 probes may be used. There are also probes that contain switches to select 10:1 or direct (1:1) ratios, but the latter setting has significant capacitance (tens of pF) at the probe tip, because the whole cable's capacitance is then directly connected. Most oscilloscopes provide for probe attenuation factors, displaying the effective sensitivity at the probe tip. Historically, some auto-sensing circuitry used indicator lamps behind translucent windows in the panel to illuminate different parts of the sensitivity scale. To do so, the probe connectors (modified BNCs) had an extra contact to define the probe's attenuation. (A certain value of resistor, connected to ground, "encodes" the attenuation.) Because probes wear out, and because the auto-sensing circuitry is not compatible between different oscilloscope makes, auto-sensing probe scaling is not foolproof. Likewise, manually setting the probe attenuation is prone to user error. Setting the probe scaling incorrectly is a common error, and throws the reading off by a factor of 10.

Special high voltage probes form compensated attenuators with the oscilloscope input. These have a large probe body, and some require partly filling a canister surrounding the series resistor with volatile liquid fluorocarbon to displace air. The oscilloscope end has a box with several waveform-trimming adjustments. For safety, a barrier disc keeps the user's fingers away from the point being examined. Maximum voltage is in the low tens of kV. (Observing a high voltage ramp can create a staircase waveform with steps at different points every repetition, until the probe tip is in contact. Until then, a tiny arc charges the probe tip, and its capacitance holds the voltage (open circuit). As the voltage continues to climb, another tiny arc charges the tip further.)

There are also current probes, with cores that surround the conductor carrying current to be examined. One type has a hole for the conductor, and requires that the wire be passed through the hole for semi-permanent or permanent mounting. However, other types, used for temporary testing, have a two-part core that can be clamped around a wire. Inside the probe, a coil wound around the core provides a current into an appropriate load, and the voltage across that load is proportional to current. This type of probe only senses AC.

A more-sophisticated probe includes a magnetic flux sensor (Hall effect sensor) in the magnetic circuit. The probe connects to an amplifier, which feeds (low frequency) current into the coil to cancel the sensed field; the magnitude of the current provides the low-frequency part of the current waveform, right down to DC. The coil still picks up high frequencies. There is a combining network akin to a loudspeaker crossover.

Gastroscope

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Contents

1 Esophagogastroduodenoscopy

Esophagogastroduodenoscopy also called by various other names, is a diagnostic endoscopic procedure that visualizes the upper part of the gastrointestinal tract down to the duodenum. It is considered a minimally invasive procedure since it does not require an incision into one of the major body cavities and does not require any significant

Esophagogastroduodenoscopy Esophageal varices - post banding.jpg Endoscopic still of esophageal ulcers seen after banding of esophageal varices, at time of esophagogastroduodenoscopy Other names EGD Upper endoscopy ICD-9-CM 45.13 MeSH D016145 OPS-301 code 1-631, 1-632

2 Medical uses

Diagnostic • Unexplained anemia (usually along with a colonoscopy) • Upper gastrointestinal bleeding as evidenced by hematemesis or melena • Persistent dyspepsia in patients over the age of 45 years • Heartburn and chronic acid reflux – this can lead to a precancerous lesion called Barrett's esophagus Persistent emesis • Dysphagia – difficulty in swallowing • Odynophagia – painful swallowing Persistent nausea • IBD (inflammatory bowel diseases)

Surveillance

• Surveillance of Barrett's esophagus • Surveillance of gastric ulcer or duodenal ulcer • Occasionally after gastric surgery

Confirmation of diagnosis/biopsy

• Abnormal barium swallow or barium meal • Confirmation of celiac disease (via biopsy)

Therapeutic

Treatment (banding/sclerotherapy) of esophageal varices Injection therapy (e.g., epinephrine in bleeding lesions) Cutting off of larger pieces of tissue with a snare device (e.g., polyps, endoscopic mucosal resection) Application of cautery to tissues Removal of foreign bodies (e.g., food) that have been ingested Tamponade of bleeding esophageal varices with a balloon Application of photodynamic therapy for treatment of esophageal malignancies Endoscopic drainage of pancreatic pseudocyst Tightening the lower esophageal sphincter Dilating or stenting of stenosis or achalasia Percutaneous endoscopic gastrostomy (feeding tube placement) Endoscopic retrograde cholangiopancreatography (ERCP) combines EGD with fluoroscopy Endoscopic ultrasound (EUS) combines EGD with 5–12 MHz ultrasound imaging

Newer interventions

Endoscopic trans-gastric laparoscopy Placement of gastric balloons in bariatric surgery

3 Complications

The complication rate is about 1 in 1000.[4] They include:

aspiration, causing aspiration pneumonia bleeding perforation cardiopulmonary problems When used in infants, the esophagogastroduodenoscope may compress the trachealis muscle, which narrows the trachea.[5] This can result in reduced airflow to the lungs.[5] Infants may be intubated to make sure that the trachea is fixed open.[5]

4 Limitations

Problems of gastrointestinal function are usually not well diagnosed by endoscopy since motion or secretion of the gastrointestinal tract is not easily inspected by EGD. Nonetheless, findings such as excess fluid or poor motion of the gut during endoscopy can be suggestive of disorders of function. Irritable bowel syndrome and functional dyspepsia are not diagnosed with EGD, but EGD may be helpful in excluding other diseases that mimic these common disorders.

Surgical Smoke Evacuation System

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1 Surgical smoke

Surgical smoke is the by-product produced by electrosurgery, laser tissue ablation, or other surgical techniques. Surgical smoke, as a health threat to those exposed to it, has become a growing concern.[1] Studies have demonstrated, depending on several factors, to possibly contain carcinogens, mutagens, irritant chemicals, live viruses and bacteria, and viable malignant cells. [1][2][3] These all pose a theoretical and demonstrable risk of harming patients or operating room personnel upon exposure.[3] Other names for surgical smoke are cautery smoke, plume, diathermy plume, or, sometimes, aerosols produced during surgery, vapor contaminants, or air contaminants.[4]

A surgeon using an electrosurgical unit, a common source of surgical smoke. Electrosurgery and laser ablation are the most common sources of surgical smoke.[3] Heat generated during surgery causes cell membranes to heat and rupture, releasing cellular debris alongside water vapor.[3] Surgical smoke is composed of 95

The amount of cellular debris in a smoke plume changes with the tissue being cauterized. The liver has been shown to generate the largest amount of particles.[3] Other than type of tissue and surgical device, operating room airflow can also affect smoke exposure.[5][3]

2 Health risks

The cellular debris included in surgical smoke has been shown to include live bacteria and viruses, and even viable malignant cells.[3] The negative effects of surgical smoke exposure to humans is less documented than its effects on animals.[5] Acute negative effects due to the exposure of surgical smoke may include headaches, eye and throat irritation, nausea, drowsiness and dizziness.[3][1] Operating personnel have been found to have an increased risk of chronic pulmonary and upper respiratory health problems compared to other populations.[3] Human papilloma virus has been the only virus to demonstrate spreading via surgical smoke, despite concern for other viruses.[6][5]

Besides potential health effects, surgical smoke can visually obscure the surgical field.[1] The amount of benzene detected in operating room air has been shown to be greater than the recommended exposure limits established by the National Institute of Occupational Safety and Health and the Occupational Safety and Health Administration (OSHA) which are respectively.[3]

3 Minimizing exposure

The pores on a standard surgical mask are 5-15m in diameter, which is inadequate in completely protecting operating room personnel from the harms of surgical smoke.[3][5] Due to studies evaluating particles passing through standard surgical masks, some suggested that more effective masks such as HEPAfilters and N95 should be used to provide better protection from cellular debris.[3] Others suggest that even are ineffective at reducing health risks associated with ultra-fine particulate matter.[5]

Smoke evacuation devices (SED) are the most effective at reducing exposure of surgical smoke.[3] However, the use of these devices is not widespread.[5] Lack of SED usage has been attributed to low amounts of education surrounding the risks of surgical smoke and the surgeons' unwillingness to adopt such devices.[3][5][6] It has been suggested that the bulkiness of these devices and noise are factors contributing to lack of surgeons' enthusiasm for SED usage.[3][6]