In [19]:

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Dense,Flatten, Dropout,BatchNorma
from keras.preprocessing.image import ImageDataGenerator, load_img, img_to_array
from tensorflow.keras.optimizers import Adam
import pandas as pd
import cv2 as cv2
import numpy as np
from matplotlib import pyplot as plt
import os
from sklearn.model_selection import train_test_split
import tensorflow as tf
```

In [3]:

```
dataset = r"C:\Breast dataset"
Yes_path = r"C:\Breast dataset\1"
No_path = r"C:\Breast dataset\0"
```

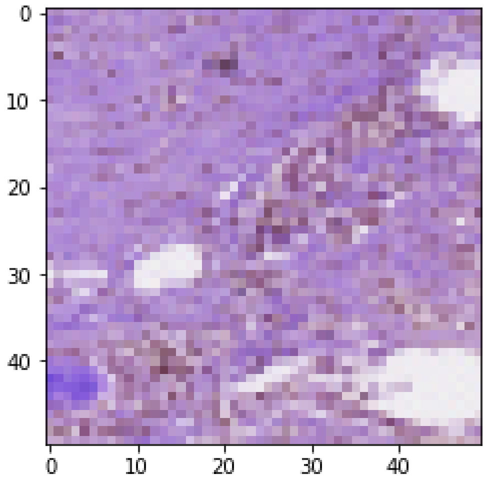
In [4]:

```
image = cv2.imread(Yes_path+'\\9023_idx5_x1301_y1351_class1.png')
print(image.shape)
plt.imshow(image)
```

```
(50, 50, 3)
```

Out[4]:

```
<matplotlib.image.AxesImage at 0x1c3380e6a00>
```



In [5]:

```
vals = [Yes_path, No_path]
print(os.listdir(vals[0]).__len__())
print(os.listdir(vals[1]).__len__())
```

```
288
583
```

In [6]:

```
pathdir = [Yes_path, No_path]
classes = ['Yes', 'No']
filepaths = []
labels = []
for i, j in zip(pathdir, classes):
    filelist = os.listdir(i)
    print(filelist)
    for vals in filelist:
        x = os.path.join(i, vals)
        filepaths.append(x)
        labels.append(j)
print(filepaths.__len__(), labels.__len__())
```

```
'9023_idx5_x1401_y2001_class1.png', '9023_idx5_x1401_y2051_class1.png',
'9023_idx5_x1401_y2101_class1.png', '9023_idx5_x1451_y1251_class1.png',
'9023_idx5_x1451_y1301_class1.png', '9023_idx5_x1451_y1351_class1.png',
'9023_idx5_x1451_y1401_class1.png', '9023_idx5_x1451_y1451_class1.png',
'9023_idx5_x1451_y1501_class1.png', '9023_idx5_x1451_y1551_class1.png',
'9023_idx5_x1451_y1601_class1.png', '9023_idx5_x1451_y1651_class1.png',
'9023_idx5_x1451_y1701_class1.png', '9023_idx5_x1451_y1751_class1.png',
'9023_idx5_x1451_y1801_class1.png', '9023_idx5_x1451_y1851_class1.png',
'9023_idx5_x1451_y1901_class1.png', '9023_idx5_x1451_y1951_class1.png',
'9023_idx5_x1451_y2001_class1.png', '9023_idx5_x1451_y2051_class1.png',
'9023_idx5_x1451_y2101_class1.png', '9023_idx5_x1501_y1251_class1.png',
'9023_idx5_x1501_y1301_class1.png', '9023_idx5_x1501_y1351_class1.png',
'9023_idx5_x1501_y1401_class1.png', '9023_idx5_x1501_y1451_class1.png',
'9023_idx5_x1501_y1501_class1.png', '9023_idx5_x1501_y1551_class1.png',
'9023_idx5_x1501_y1601_class1.png', '9023_idx5_x1501_y1651_class1.png',
'9023_idx5_x1501_y1701_class1.png', '9023_idx5_x1501_y1751_class1.png',
'9023_idx5_x1501_y1801_class1.png', '9023_idx5_x1501_y1851_class1.png',
'9023_idx5_x1501_y1901_class1.png', '9023_idx5_x1501_y1951_class1.png',
'9023_idx5_x1501_y2001_class1.png', '9023_idx5_x1501_y2051_class1.png',
```

In [7]:

```
dataset = list(zip(filepaths, labels))
pathframe = pd.DataFrame(dataset, columns=['filepaths', 'labels'])
```

In [8]:

```
pathframe.__len__()
pathframe.tail()
```

Out[8]:

	filepaths	labels
866	C:\Breast dataset\0\9023_idx5_x951_y751_class0...	No
867	C:\Breast dataset\0\9023_idx5_x951_y801_class0...	No
868	C:\Breast dataset\0\9023_idx5_x951_y851_class0...	No
869	C:\Breast dataset\0\9023_idx5_x951_y901_class0...	No
870	C:\Breast dataset\0\9023_idx5_x951_y951_class0...	No

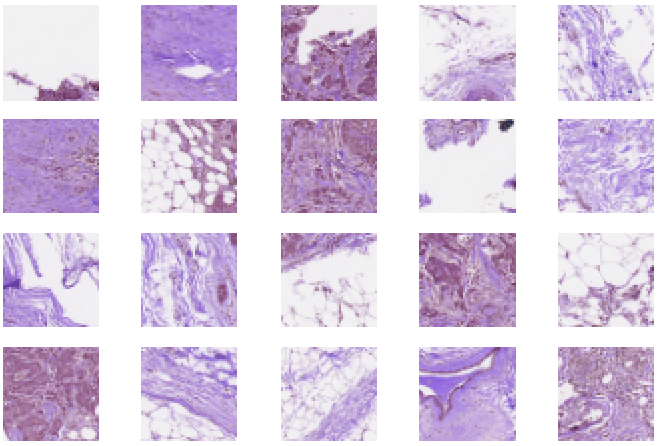
In [9]:

```
print(pathframe['labels'].value_counts())
```

```
No     583
Yes    288
Name: labels, dtype: int64
```

In [10]:

```
for i in range(0, 20):
    vals = np.random.randint(1, len(pathframe))
    plt.subplot(4,5, i+1)
    plt.imshow(cv2.imread(pathframe.filepaths[vals]))
    plt.axis('off')
plt.show()
```



In [11]:

```
Train, Test = train_test_split(pathframe, train_size=0.90, random_state=0)
Train_new, valid = train_test_split(Train, train_size = 0.90, random_state=0)
print(Train.shape, Test.shape, Train_new.shape, valid.shape)
```

```
(783, 2) (88, 2) (704, 2) (79, 2)
```

In [15]:

```
train_datagen = ImageDataGenerator(rescale=1.0/255, rotation_range= 40 , width_shift_range=
                                   zoom_range=0.2, horizontal_flip = True, vertical_flip= Tr
test_datagen = ImageDataGenerator(rescale=1.0/255)
```

In [16]:

```
train_gen = train_datagen.flow_from_dataframe(dataframe = Train_new, x_col = 'filepaths', y
                                             target_size=(50,50), class_mode = 'binary', sh

valid_gen = train_datagen.flow_from_dataframe(dataframe = valid, x_col = 'filepaths', y_col
                                             target_size=(50,50), class_mode = 'binary', sh
test_gen = train_datagen.flow_from_dataframe(dataframe = Test, x_col = 'filepaths', y_col='
                                             target_size=(50,50), class_mode = 'binary', sh
```

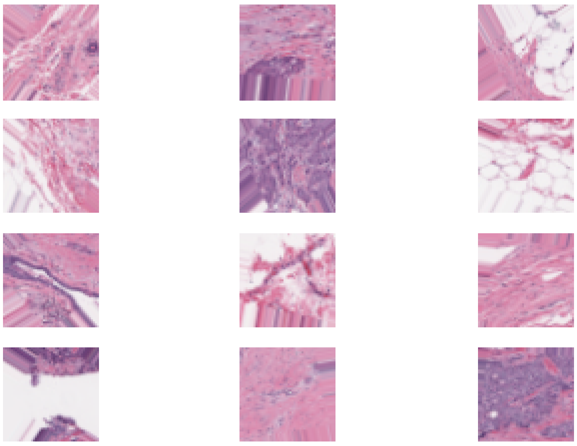
```
Found 704 validated image filenames belonging to 2 classes.
Found 79 validated image filenames belonging to 2 classes.
Found 88 validated image filenames belonging to 2 classes.
```

In [17]:

```
print(train_gen.class_indices)
print(train_gen[0][0].shape)

for i in range(0, 12):
    val = train_gen[0][0][i]
    plt.subplot(4,3,i+1)
    plt.imshow(val)
    plt.axis('off')
plt.show()
```

```
{'No': 0, 'Yes': 1}
(16, 50, 50, 3)
```



In [20]:

```
base_model = tf.keras.applications.InceptionResNetV2(weights='imagenet', input_shape= (150,
model = Sequential()
model.add(base_model)
model.add(GlobalAveragePooling2D())
model.add(Dense(128, activation='relu'))
model.add(BatchNormalization())
model.add(Dropout(0.2))
model.add(Dense(1, activation='sigmoid'))
```

In [21]:

```
callbacks = tf.keras.callbacks.EarlyStopping(monitor='val_accuracy', patience = 2, min_delt
model.compile(loss='binary_crossentropy', optimizer= Adam(lr=0.01), metrics=['accuracy'])
model.fit(train_gen, validation_data= valid_gen, epochs=12, verbose=1)
```

```
C:\Users\KIIT\anaconda3\lib\site-packages\keras\optimizer_v2\adam.py:105: Us
erWarning: The `lr` argument is deprecated, use `learning_rate` instead.
  super(Adam, self).__init__(name, **kwargs)

Epoch 1/12
44/44 [==============================] - 63s 616ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 2/12
44/44 [==============================] - 21s 478ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 3/12
44/44 [==============================] - 21s 480ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 4/12
44/44 [==============================] - 22s 510ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 5/12
44/44 [==============================] - 22s 493ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 6/12
44/44 [==============================] - 21s 484ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 7/12
44/44 [==============================] - 22s 488ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 8/12
44/44 [==============================] - 22s 489ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 9/12
44/44 [==============================] - 22s 493ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 10/12
44/44 [==============================] - 23s 514ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 11/12
44/44 [==============================] - 22s 490ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
Epoch 12/12
44/44 [==============================] - 22s 489ms/step - loss: nan - accura
cy: 0.6619 - val_loss: nan - val_accuracy: 0.7468
```

Out[21]:

```
<keras.callbacks.History at 0x1c338e5d5e0>
```

In [22]:

```
model.evaluate(test_gen)
```

```
6/6 [==============================] - 2s 90ms/step - loss: nan - accuracy:
0.6591
```

Out[22]:

```
[nan, 0.6590909361839294]
```

In [ ]:

```
```